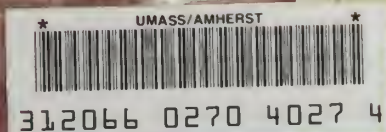


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Supplemental Draft Environmental Impact Statement/Final Environmental Impact Report

EOEA #10458

Logan Airside Improvements Planning Project

Boston
Logan
International
Airport

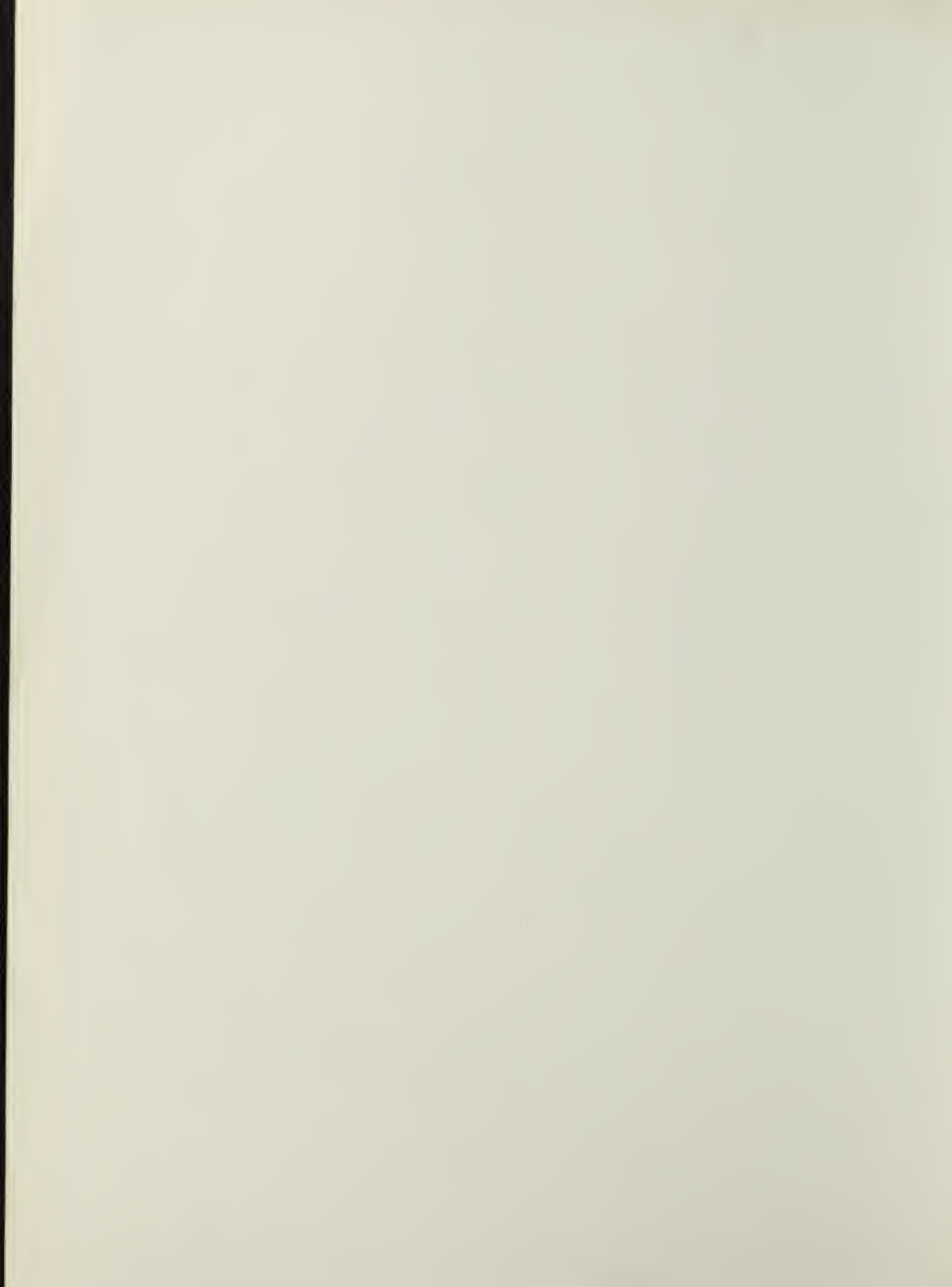


Massachusetts Port Authority



Federal Aviation Administration

Volume 1



LOGAN AIRSIDE IMPROVEMENTS PLANNING PROJECT
BOSTON-LOGAN INTERNATIONAL AIRPORT
BOSTON, MASSACHUSETTS

SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT/
FINAL ENVIRONMENTAL IMPACT REPORT (EOEA #10458)

Submitted Pursuant to
42 USC §§ 4332 (2)(c), the National Environmental Policy Act;
M.G.L. c.30, §§ 61-62H, the Massachusetts Environmental Policy Act

by the
**Federal Aviation Administration
and the
Massachusetts Port Authority
March 2001**

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Abstract: This Supplemental Draft Environmental Impact Statement (SDEIS)/Final Environmental Impact Report (FEIR), reviews the potential environmental impacts associated with the Logan Airside Improvements Planning Project, designed to reduce current and projected future levels of aircraft delay and improve operational efficiency of Logan International Airport in Boston, Massachusetts. A Preferred Alternative was selected as a result of a comprehensive analysis of four packages of improvement concepts and a No Action Alternative in the Airside Improvements Planning Project Draft EIS/EIR, February 1999. The Preferred Alternative involves: the construction of a new unidirectional Runway 14/32; a new centerfield taxiway; reconfiguration of the southwest corner taxiway system; extension of existing Taxiway Delta; and realignment of existing Taxiway November. The proposed unidirectional Runway 14/32 would reduce delay by enabling air traffic controllers to maintain a two-or three-runway operating configuration during periods of poor weather conditions or moderate to high northwest winds. The taxiway improvements would reduce delay by reducing taxiway congestion and facilitating more efficient movement of aircraft. The Preferred Alternative also includes reducing the approach minimums on the four existing runways (22L, 27, 15R and 33L) in order to make them more available during poor weather conditions, and thereby enhance safety. The three-runway configuration permitted by construction of Runway 14/32 and the reduction of the approach minimums on four existing runways would enable better conformance with Preferential Runway Advisory System goals which are designed to distribute noise impacts among affected communities. The Preferred Alternative will generally result in improvements to noise and air quality when compared to the No Action Alternative, but will result in certain unavoidable impacts that can be mitigated.

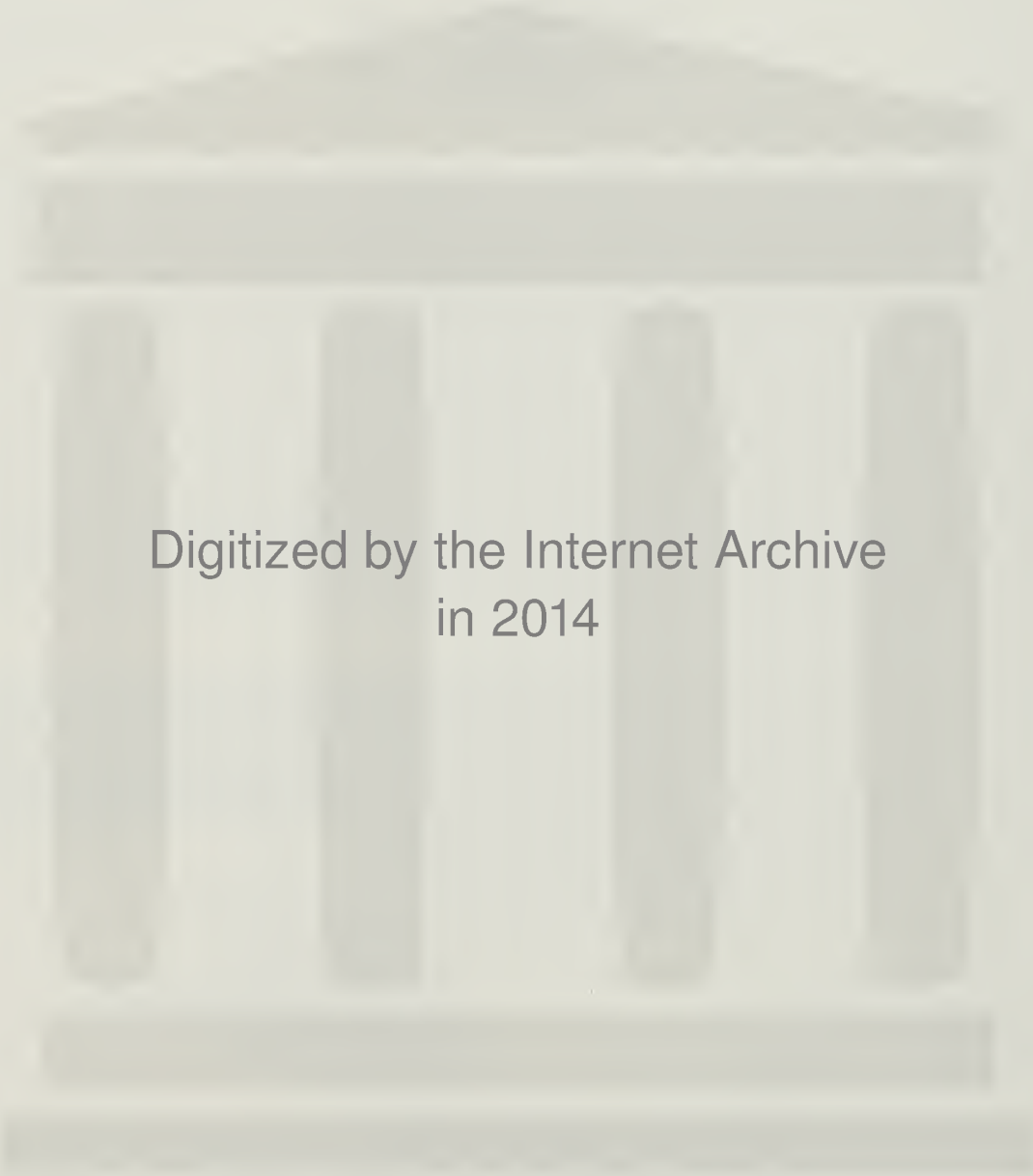
In January 2000, in response to the FAA's review of the Draft EIS (which was submitted for federal review in February 1999), the FAA called for preparation of a Supplemental Draft EIS, to be prepared after a panel review process called for by the Administrator. This SDEIS includes analysis specified by the FAA based upon a special set of work tasks developed as a result of the SDEIS panel review process, as well as comments received on the Draft EIS. The Supplemental Draft EIS is being jointly prepared as a Final Environmental Impact Report for submission to the Massachusetts Executive Office of Environmental Affairs. The Final Environmental Impact Report includes analysis required by the Certificate of the Massachusetts Secretary of the Executive Office of Environmental Affairs dated May 7, 1999 and responds to comments received on the Draft EIR.

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Comments on this Supplemental Draft EIS are due to the FAA by May 7, 2001 and may be sent to either of the above parties. Comments on the Final EIR (EOEA# 10458) are due by May 11, 2001 and may be sent to the Executive Office of Environmental Affairs, MEPA Office, 251 Causeway Street, Suite 900, Boston, MA 02114.



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EOEA #10458

Logan Airside Improvements Planning Project

Boston
Logan
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Massachusetts Port Authority



Federal Aviation Administration

March 2001

Volume 1



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Preface

The Boston Logan International Airport Airside Improvements Planning Project Supplemental Draft Environmental Impact Statement/Final Environmental Impact Report (Supplemental DEIS/FEIR) is jointly prepared by the Federal Aviation Administration (FAA) and the Massachusetts Port Authority (Massport). The FAA is the lead federal agency for purposes of Airport Layout Plan (ALP) approval and any federal funding approval, which are federal actions subject to the National Environmental Policy Act (NEPA). The FAA is also the project proponent with respect to the reduction in runway approach minimums for Runways 15R, 22L, 27 and 33L, and implementation of runway instrumentation. Massport is the project proponent for all of the other identified improvement concepts comprising the Preferred Alternative, which fall within its purview as proprietor of Boston-Logan International Airport.

This Supplemental Draft EIS has been prepared in response to a decision by the FAA, and to satisfy the procedural requirements of NEPA; the Council on Environmental Quality's (CEQ) *Regulations for Implementing the Procedural Requirements of the National Environmental Policy Act of 1969*, as amended, 40 CFR Part 1500; and the FAA's Airport Environmental Handbook (FAA Order 5050.4A). This document has also been prepared to satisfy the requirements of the Massachusetts Environmental Policy Act (MEPA) and its implementing regulations.¹ Because the document fulfills both federal and state purposes, it is referred to as a Supplemental Draft Environmental Impact Statement/Final Environmental Impact Report.

Federal EIS Process

On February 1, 1999, Massport, in a joint effort with the FAA, submitted a Draft Environmental Impact Statement/Environmental Impact Report (Airside Project Draft EIS/EIR) for the Airside Improvements Planning Project (Airside Project). Approximately 500 comment letters were received during the applicable Airside Project Draft EIS/EIR federal and state comment periods from various governmental entities, including the US Environmental Protection Agency (EPA), the Massachusetts Department of Environmental Protection, the Massachusetts Natural Heritage and Endangered Species Program, the City of Boston, various elected and other public officials, community groups, individual residents and other interested parties.



¹ 301 CMR 11.00 MEPA Regulations

In January 2000, following issuance of the Draft EIS, the FAA called for preparation of a Supplemental Draft EIS to address specific issues identified by the FAA as a result of comments received during the DEIS review process. At the FAA's direction, a Supplemental Draft EIS Panel (SDEIS Panel), consisting of three members appointed by the Governor of the Commonwealth of Massachusetts and three appointed by the Mayor of the City of Boston, was formed. Under the direction of the FAA New England Region, the SDEIS Panel convened in March of 2000 and then met 12 times, concluding with a final meeting in December of 2000. In addition to these formal meetings, the SDEIS Panel also made visits to Hanscom Field, Worcester Regional Airport, T.F. Green/Providence Airport, Manchester Airport, and the Logan ATC Tower. To provide the the SDEIS Panel with appropriate background, it was presented with: (a) an Interim Supplemental Draft EIS to the Airside Project Draft EIS/EIR; (b) answers to key letters written by members of the public, concerned agencies and public officials responding to the Airside Project Draft EIS/EIR; and (c) a series of 15 visual and written presentations from the Airside Project's technical consulting team and other independent transportation industry experts, both in favor of and in opposition to the Airside Project (minutes from the SDEIS Panel meetings are contained in Appendix A). This document reflects a special set of work tasks developed by the FAA as a result of the SDEIS Panel review process and constitutes the Supplemental Draft Environmental Impact Statement.

State EIR Process

The Draft EIR was the subject of an extended public comment period including public hearings on April 7, 1999 at the State Transportation Building in Boston and April 8, 1999 at the Holiday Inn in East Boston. On May 7, 1999 the Massachusetts Secretary of Environmental Affairs issued a Certificate ("EOEA Certificate") on the Draft Environmental Impact Report (Draft EIR) for the Logan Airside Improvements Planning Project. The Secretary determined in his Certificate that the Draft EIR had adequately and properly complied with the Massachusetts Environmental Policy Act (MEPA) (M.G.L. c. 30, ss. 61-62H) and its implementing regulations (301 C.M.R. 11.00). The Secretary also found that the Draft EIR presented enough information on alternatives, impacts and mitigation to meet the MEPA standard and should therefore proceed to the stage of a Final EIR. The EOEA Secretary directed that the Final EIR must address certain specific issues, as well as adequately respond to the substantive comments received. This document responds to the EOEA Certificate and includes separate volumes containing responses to comments received on the Airside Project Draft EIR.

Organization of this Supplemental Draft EIS/Final EIR

The Airside Project Draft EIS/EIR, submitted in February 1999, provided a comprehensive assessment of the benefits and potential impacts of all the project alternatives in accordance with federal and state scoping directives. Potential impacts were identified by category and quantified in relation to the proposed alternatives. This Supplemental DEIS/FEIR is

intended to complement and to be reviewed in conjunction with the Airside Project Draft EIS/EIR. As explained below, each chapter in this Supplemental DEIS/FEIR summarizes the major findings of the Airside Project Draft EIS/EIR, focuses on additional analyses conducted for the Supplemental DEIS/FEIR, and documents impacts associated with the Preferred Alternative. The “Key Points” section at the beginning of each chapter summarizes the key points for that chapter from the Airside Project Draft EIS/EIR, and reflects analyses conducted in response to the EOE A Secretary and/or the FAA’s work tasks for the SDEIS.

A comparison between the chapters of the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR is provided in Table P-1 at the end of this Preface. Table P-2, also at the end of this Preface, outlines the analysis tasks required by the FAA as a result of the SDEIS Panel process. To assist the reader, the table outlines where these analyses are located within the Supplemental DEIS/FEIR.

The document is comprised of an Executive Summary and 11 volumes, the contents of which are summarized below.

Executive Summary	Available as a separate volume
Volume 1	Preface
	Executive Summary,
	Chapter 1 - Project Background, Purpose and Need
	Chapter 2 - Logan’s Role in the Regional Transportation System
	Chapter 3 - Alternatives
	Chapter 4 - Delay Analysis
Volume 2	Chapter 5 - Affected Environment
	Chapter 6 - Environmental Consequences
	Chapter 7 - Cumulative Impacts
	Chapter 8 - Preferred Alternative and Mitigation
	List of Preparers
	Reviewers List
	Acronyms
	Index
Volume 3	Appendix A - FAA SDEIS Panel Process
Appendices	Appendix B - Regional Transportation
	Appendix C - Delay
	Appendix D - Northwest Wind Runway Use Restriction
	Appendix E - Noise
	Appendix F - Air Quality
	Appendix G - Wildlife
	Appendix H - Cultural Resources
	Appendix I - Environmental Justice
	Appendix J - Construction
Volumes 4 – 11	EOEA Certificate and Responses
Responses to Comments	Comment Letters and Responses

- **Preface** – Provides a guide to the organization of this Supplemental DEIS/FEIR and its relationship to the Airside Project Draft EIS/EIR.
- **Executive Summary** – Provides an overview of the Supplemental DEIS/FEIR and is published as a separate document.
- **Chapter 1: Project Background, Purpose and Need** – In the Airside Project Draft EIS/EIR, this chapter served as an introduction and provided the foundation for the project purpose and need. In this Supplemental DEIS/FEIR, this chapter presents a summary of the key points in the Airside Project Draft EIS/EIR and provides further clarification of the delay problem at Logan Airport. In response to a number of substantive comments, including those of the FAA, the SDEIS Panel and the EOEASecretary, this chapter provides historical context for Logan Airport’s delay problem; compares Logan Airport to other major U.S. airports; provides a more comprehensive discussion of delays; and guides the reader through complex delay terminology and the different measures of delay. Chapter 1 broadens the discussion of delays to include those that are caused by Logan Airport, as well as those incurred by Logan Airport passengers but caused by conditions at other airports or Air traffic Control (ATC) related problems. To respond to a FAA SDEIS work task, Massport has also attempted to assess the effect that Runway 14/32 would have had on Logan Airport’s national delay ranking in 1998 if it had been available.
- **Chapter 2: Logan’s Role in the Regional Transportation System** – In the Airside Project Draft EIS/EIR, Chapter 2 evaluated the extent to which regional transportation options, including other New England airports and advances in passenger rail services, may affect projected passenger demand at Logan Airport. Many comments received on the Airside Project Draft EIS/EIR focused on regional transportation issues and the importance of planning in a regional context. In response to the high level of public interest and concern regarding this topic, the EOEASecretary instructed Massport to significantly expand upon the regional transportation analysis that was presented in the Airside Project Draft EIS/EIR. The FAA SDEIS Panel reinforced the Secretary’s concerns. Throughout the 10-month panel review process, the SDEIS Panel indicated the need for ongoing regional planning by all relevant regional transportation agencies. As a result of these concerns, and as a follow-up to an earlier planning effort, Massport, the FAA, the regional airports, and New England state aviation planning agencies are conducting a new regional aviation system planning initiative, the New England Airports System Study.

Chapter 2 describes the purpose and proposed scope of work for the New England Airports System Study, which will be sponsored by the FAA, the regional airports and Massport. Chapter 2 also provides an updated and more detailed analysis of regional transportation options, including a discussion of the evolving roles of the major commercial airports that will serve a majority of the region’s passengers for the foreseeable future, namely Boston-Logan International Airport; T.F. Green Airport in Warwick, Rhode Island; Manchester Airport in New Hampshire, and the Worcester Regional Airport in Massachusetts. New analysis is presented to quantify the

potential role to be played by Worcester in providing relief for Logan Airport in the western portion of its service area and what Massport and the other state transportation agencies are doing to encourage that function. In addition, in response to the directive of the EOEa Secretary, Massport reports on the current status of proposed ground access improvements at Logan, Manchester, T.F.

Green/Providence and Worcester airports and quantifies any effects these changes would have on passenger demand at these airports. In view of the recent rapid growth enjoyed by the regional airports and their impact on diverting traffic from Logan Airport, the forecast period has been extended from 2010 to 2015, when Logan Airport is expected to serve 37.5 million air passengers. The analysis supporting this extended forecast period is described in Chapter 2.

- **Chapter 3: Alternatives**— In the Airside Project Draft EIS/EIR, Chapter 3 provided a detailed description of the Alternatives analyzed as part of the Airside Project as specified in federal and state scoping directives. In this Supplemental DEIS/FEIR, these alternatives are reviewed again, but in more summary form. In response to FAA's additional work tasks for the Supplemental DEIS, this chapter further clarifies the proposed Centerfield Taxiway and the number of aircraft queuing on that and other taxiways. In response to a number of comments on the Airside Project Draft EIS/EIR, this chapter also includes a more detailed discussion of Massport's Program for Airfield Capacity Efficiency (PACE), which provides a more complete context for previous demand management programs at Logan Airport, and examines the PACE impact for relevance to the Peak Period Pricing concept currently under consideration. Chapter 3 also discusses demand management strategies already in place at other US and international airports.
- **Chapter 4: Delay Analysis** – In the Airside Project Draft EIS/EIR, Chapter 4 discussed the passenger and aircraft operations forecasts, the delay modeling methodology and the results of the airfield delay analysis. Both the EOEa Secretary and the FAA asked for clarification regarding the use of 1993 as a base year. Chapter 4 of this Supplemental DEIS/FEIR incorporates 1998 operational data to supplement and update the 1993 analysis. By applying the same capacity and delay modeling completed for the 1993 Historic Modeled condition, as well as the future forecast scenarios, the addition of the 1998 Actual Condition provides a current assessment of delay levels at Logan Airport.

Chapter 4 includes updated operational and environmental analyses of 1998 conditions similar to that contained in the *Logan International Airport 1998 Annual Update (October 1999)*. While the *Logan International Airport 1999 Environmental Status and Planning Report (ESPR) (December 2000)* includes updated analyses for 1999, the differences between the two study years are small. Since the relevant comparison for evaluating the proposed Airside Project improvements is the comparison between the No Action and Preferred Alternatives, and since 1998 and 1999 are similar in terms of passengers, operations, and environmental impacts, this Supplemental DEIS/FEIR includes the 1998 modeling analysis as a representation of recent conditions at Logan Airport.

The FAA conducted further analysis to better understand the future role of regional jets (RJs), which are rapidly being added to airline fleets at Logan Airport. Specifically, the FAA suggested examining the delay reduction effectiveness of the proposed 5,000 foot runway given a fleet with more regional jets than previously forecast. This Supplemental DEIS/FEIR presents a third fleet for the 37.5 million air passenger level (37.5M) that reflects a high proportion of regional jets, and a correspondingly low proportion of turboprops. This additional fleet is referred to as the 37.5M High RJ Fleet. In terms of operation levels, the 37.5M High RJ Fleet falls between the 37.5M Low and High Fleets.² For the purposes of assessing delay, the delay model inputs reflect the recommendation of a separate evaluation by the FAA's consultant regarding the use of the proposed runway by the RJ Fleet. Those assumptions are discussed in Chapter 4 of this Supplemental DEIS/FEIR. The delay reduction results of all five Alternatives (Alternatives 1, 1A, 2, 3, and No Action) under the 37.5M High RJ Fleet are included at the end of Chapter 4.

As part of the preparation of this FEIR, the EOEa Secretary instructed Massport to complete several analyses that would allow a more complete evaluation of Peak Period Pricing including a Peak Period Monitoring System and an Exemption Program for communities dependent on Logan Airport. Although Massport does not recommend immediate implementation of Peak Period Pricing as part of the Preferred Alternative, the Authority recognizes the potential delay reduction benefits associated with Peak Period Pricing in an environment of airline overscheduling. Massport is prepared to implement Peak Period Pricing when necessitated by airline overscheduling. In Chapter 4 of this Supplemental DEIS/FEIR, Massport proposes a tightly crafted exemption program that would protect greatly affected communities from losing connections to the national air transportation system. Incorporating a small community exemption program is intended to reduce the expected degree of service disruptions resulting from Peak Period Pricing, without undermining the program's delay reduction benefits. Chapter 4 of the Supplemental DEIS/FEIR presents a Peak Period Monitoring program designed by Massport to determine when airline scheduling may become problematic. The EOEa Secretary also suggested that specific analysis be conducted to determine whether a peak period surcharge could have the adverse impact of encouraging "increased reliance on early morning and late evening flights." Chapter 4 of this Supplemental DEIS/FEIR also discusses the potential for alterations in the regional airline fleet mix resulting from Peak Period Pricing.

At the FAA's and the EOEa Secretary's request, Massport broadened the discussion of the Preferential Runway Advisory System (PRAS) by providing further context to the PRAS Program. Chapter 4 of this Supplemental DEIS/FEIR examines land use patterns and residential densities among the affected communities, in order to

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The proposed Airside Project Improvements were evaluated against a near-term demand level of 29 million annual passengers and long-term levels of 37.5 and 45 million passengers. These demand levels are expected in the years 2003, 2015, and 2024, respectively, and at each passenger level, two different operations forecasts were developed. The High and Low scenarios, presented in the Airside Project Draft EIS/EIR, reflect differing fleet mix assumptions. The Low fleets assume more large jet operations than non-jet operations, similar to current conditions. The High fleets assume a greater proportion of non-jet aircraft and thus a higher level of total operations for the same passenger level.

determine whether they have remained relatively unaltered since the PRAS Program was initially developed. Chapter 4 also examines historic PRAS achievement, in order to determine its utility as a part of the baseline for the No Action Alternatives. The chapter also describes current PRAS monitoring practices and details specific Massport commitments for more frequent and comprehensive PRAS monitoring and public reporting.

An important goal of PRAS is to route flights over the water between 12:00 AM and 6:00 AM. The EOE Secretary requested that Massport examine the potential for extending the nighttime hours for routing aircraft over water. Chapter 4 of this Supplemental DEIS/FEIR examines the feasibility of extending this preferential nighttime routing policy.

The concept of restricting the availability and use of Runway 32 to northwest wind conditions only was discussed during the SDEIS Panel process. Appendix D addresses the impact of such a restriction on delay reduction, runway utilization and PRAS achievement. This analysis was conducted under the 37.5M High RJ Fleet scenario.

- **Chapter 5: Affected Environment** – In the Airside Project Draft EIS/EIR, Chapter 5 presented an overview of the baseline environmental conditions within the airport and surrounding communities. In Chapter 5 of this Supplemental DEIS/FEIR, the analysis of baseline conditions was expanded to include evaluation of the current environmental conditions that were presented in the *1998 Annual Update*.³ Chapter 5 was also modified to include a description of historic properties and parklands within the project impact area (this material was previously contained in Chapter 8 of the Airside Project Draft EIS/EIR) to support the analysis of potential impacts regulated under Section 4(f) of the Department of Transportation Act, and under Section 106 of the National Historic Preservation Act of 1966, as amended.
- **Chapter 6: Environmental Consequences** -- In the Airside Project Draft EIS/EIR, Chapter 6 described the potential benefits and impacts of each alternative with regard to social, cultural and environmental resources. Chapter 6 of this Supplemental DEIS/FEIR repeats much of this analysis, but focuses the comparison between the Preferred Alternative (all actions except Peak Period Pricing) and the No Action Alternative for the 29 million passengers⁴ (29M) Low and the 37.5 million passengers⁵ (37.5M) High fleets. These fleets were chosen because the 29M Low reflects the worst case in terms of noise, and together they represent the full range of potential impacts. In addition, the environmental impacts associated with each alternative for the 37.5M High RJ Fleet are included for review in this Supplemental DEIS/FEIR. The remaining alternatives are presented in the Airside Project Draft EIS/EIR and repeated again in Appendices E and F of this Supplemental DEIS/FEIR.

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 3 Boston-Logan International Airport: 1998 Annual Update, October 15, 1999.

4 The Low operations fleet scenarios assume more large jet operations than non-jet operations, similar to current conditions.

5 The High operations fleet scenarios assume a greater proportion of non-jet aircraft and thus a higher level of total operations for the same passenger level.

To provide further clarity for the affected areas, the noise analysis is presented through Geographic Information System (GIS) mapping with a more detailed base map and a different scale than was presented in Chapter 6 of the Airside Project Draft EIS/EIR. For the Preferred Alternative, the numbers and locations of people who are exposed to noise in the No Action Alternative or who will be exposed to each 5 decibel (dB) increment of noise exposure from Day-Night Sound Level (DNL) values of 60 to 70 dB, and the number and location of people who are expected to shift into a different 5 dB increment of exposure, are presented in tabular and graphical form. These results are reported for people who experience increases as well as decreases in noise exposure. This Supplemental DEIS/FEIR also includes the noise contours and noise-exposed populations for Alternatives 1, 1A, 2, 3, and 4 for the 37.5M High RJ Fleet.

Chapter 6 of this Supplemental DEIS/FEIR discusses the relationship between the Airside Project analysis and FAA's *Runway 27 EIS*.⁶ Chapter 6 was modified from the Airside Project Draft EIS/EIR to include a description of historic properties and parklands within the Airside Project impact area and a summary of potential impacts and mitigation. This material was previously contained in Chapter 8 of the Airside Project Draft EIS/EIR. In response to the FAA's additional work tasks for the SDEIS, Appendix E includes a school year/school day 65 dB DNL contour for the Preferred Alternative for the 29M Low Fleet.

In the Airside Project Draft EIS/EIR, the Environmental Justice analysis was presented in Chapter 8. In response to comments received on the Airside Project Draft EIS/EIR from the EPA Region 1 and others, the presentation of Environmental Justice has been significantly expanded. Chapter 6 of this Supplemental DEIS/FEIR (Section 6.8) includes a discussion of Environmental Justice requirements and additional Environmental Justice analyses requested by the EOEa Secretary. The Environmental Justice discussion includes more detailed demographic data presented in both tabular and GIS map formats; an analysis of impacts at the 60 dB level, as requested by the EOEa Secretary; a comparison of the affected population with that of Boston and other affected municipalities; a discussion of other environmental and health effects in accordance with CEQ guidance; and a discussion of the community participation process followed for review of the Airside Project. Finally, the discussion and depiction of flight paths is enhanced to show additional geographic coverage.

- **Chapter 7: Cumulative Impacts** – In the Airside Project Draft EIS/EIR, Chapter 7 presented an assessment of incremental environmental impacts of the alternatives in the context of other past, present, and reasonably foreseeable projects. Chapter 7 of this Supplemental DEIS/FEIR presents an updated construction management plan that quantifies the number of daily and total truck trips expected in connection with the Airside Project and any other major construction activities planned to occur in East Boston.

- **Chapter 8: Preferred Alternative and Mitigation** – Chapter 8 describes Massport’s project specific mitigation measures which include:
 - ❑ Commitments to reinforce the unidirectional use restriction on Runway 14/32.
 - ❑ Sound insulation for eligible residences located within the Preferred Alternative 65 dB DNL contour for the 29M Low Fleet scenario.
 - ❑ Relocation assistance for the airport tenants affected by construction of Runway 14/32.
 - ❑ Habitat enhancement for the state-listed endangered upland sandpiper.
 - ❑ Construction mitigation measures including participation in the Clean Air Construction Initiative.

In addition to project specific mitigation, the May 7, 1999 EOECA Certificate required Massport to commit to a number of “concrete mitigation measures...that will maintain or reduce the existing envelope of cumulative environmental impacts from airport operations.” Specific measures identified by the EOECA Secretary that are addressed in this Supplemental DEIS/FEIR include:

- ❑ Steps to be taken by Massport and other state transportation agencies to ensure that the Worcester, Manchester and T.F. Green/Providence airports operate jointly with Logan Airport as the key elements in an efficient and environmentally balanced regional air transportation network.
- ❑ Regular monitoring of peak period airline schedules and delays and definition of the appropriate conditions at which Massport will implement a Peak Period Pricing Program.
- ❑ Protocols for monitoring adherence to the PRAS goals and periodic disclosure of monitoring results.
- ❑ Massport and the FAA will continue to complete the current 2-year sound insulation program as presented in the *Logan Airport 1999 Environmental Status and Planning Report*.
- ❑ Specific noise mitigation commitments to minimize nighttime noise.
- ❑ Work with air carriers to reduce the use of noisier “hushkitted” aircraft at Logan Airport.

Chapter 8 also includes Massport’s Draft Section 61 Findings under MEPA. A comparison between the chapters of the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR is provided in Table P-1. Table P-2 outlines the analysis tasks required by the FAA following the SDEIS Panel process. To assist the reader, the table outlines where these analyses are located within this Supplemental DEIS/FEIR.

Table P-1
Airside Project
Comparison between the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR

Chapter	Airside Project Draft EIS/EIR	Supplemental DEIS/FEIR
1 Project Background, Purpose and Need	■ Project overview ■ Foundation of analyses □ Logan's role in the regional economy □ Passenger volumes and aircraft operations □ Delays at Logan, and cost implications □ Logan's operations	■ Summary of key points from the Draft EIS/EIR ■ Comprehensive discussion of delays at Logan ■ Comparison of Logan to other United States airports in terms of delay ■ Analysis of Logan delays caused elsewhere in the system ■ Analysis of Logan's national delay ranking if Runway 14/32 were available
2 Logan's Role in the Regional Transportation System	■ Effects of regional alternatives (regional airports and rail) to Logan on projected air passenger demand □ Regional transportation context and role of Logan □ Role of alternative travel choices □ Report on support for regional alternatives	■ Summary of key points from the Draft EIS/EIR ■ Expanded regional transportation analysis ■ Discussion of changing role of Logan, T.F. Green/Providence, Manchester, and Worcester airports ■ Quantitative analysis of potential relief provided by Worcester Regional Airport ■ Impact of regionalization on Logan demand forecasts ■ Report on status of proposed ground access improvements at Logan, Manchester, T.F. Green/Providence, and Worcester airports ■ Report on existing studies relating to environmental impacts associated with continued growth at regional airports (Refer to Appendix B for additional information) ■ Describe planned New England Airports System Study
3 Alternatives	■ Detailed description of concepts and alternatives analyzed □ Unidirectional Runway 14/32 □ Taxiway Improvements □ Reduced Approach Minimums □ Peak Period Pricing □ Alternative Packages	■ Summary of key points from the Draft EIS/EIR ■ Detailed discussion of PACE program, and its relevance to Peak Period Pricing ■ Discussion of demand management strategies used by other airports ■ Clarification of Centerfield Taxiway on taxiway queuing

Table P-1 (Cont'd.)**Airside Project****Comparison between the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR**

Chapter	Airside Project Draft EIS/EIR	Supplemental DEIS/FEIR
4 Delay Analysis	■ Discussion of passenger and aircraft operations forecasts and assumptions □ Passenger and Aircraft Operations Forecasts □ Delay Modeling Approach □ Peak Period Pricing ■ Aircraft Delay and Runway Use Results	■ Summary of key points from the Draft EIS/EIR ■ Clarification of use of 1993 Historic Modeled as baseline condition ■ Description of additional analysis condition - 1998 Existing Condition, based on the 1998 Annual Update ■ Discussion of new 37.5M High RJ Fleet ■ Evaluation of current assessment of delay levels at Logan (1998) ■ Expanded evaluation of Peak Period Pricing ■ Consideration of small-community exemption program ■ Discussion of potential for alteration in the regional airline fleet mix result from Peak Period Pricing. Broadened discussion of PRAS program including examination of land use patterns and residential densities in affected communities ■ Examination of historic levels of PRAS achievement ■ Examination of feasibility of extending PRAS nighttime hours ■ Operational analysis of 37.5M High RJ Fleet ■ Discussion of potential northwest wind use restriction on Runway 14/32
5 Affected Environment	■ Overview of baseline (1993 historic modeled) environmental condition within the airport and surrounding communities □ Noise □ Air Quality/Odors □ Ecosystems □ Water Quality ■ Soil/Sediment Characterization	■ Summary of key points from the Draft EIS/EIR ■ Comparison of environmental conditions for the 1993 historic modeled conditions with 1998 actual conditions (based on the findings of the <i>1998 Annual Update</i>) ■ Addition of description of historic properties and parklands within the project impact area (formerly in Chapter 8 of the Airside Project Draft EIS/EIR)

Table P-1 (Cont'd.)

Airside Project

Comparison between the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR

Chapter	Airside Project Draft EIS/EIR	Supplemental DEIS/FEIR
6 Environmental Consequences	■ Description of potential benefits and impacts of each alternative with regard to social, cultural, and environmental resources □ Land Use and Social Impacts □ Noise □ Air Quality/Odors □ Ecosystems □ Water Resources □ Soil/Sediment Impacts □ Construction Impacts	■ Summary of key points from the Draft EIS/EIR ■ Review of potential benefits and impacts of each alternative, but with a focused comparison of the Preferred Alternative (all actions except Peak Period Pricing), to the No Action Alternative ■ Analysis of environmental benefits and impacts of a 37.5M High RJ Fleet ■ GIS mapping with a more detailed base map showing land use at a larger scale ■ Tabular and graphic comparison of the Preferred Alternative and No Action Alternative showing the number and location of people who are exposed to noise ■ Discussion of the relationship between the analyses conducted for the Airside Project and the Runway 27 EIS ■ Focused noise contour analysis comparing the 1998 Annual Update, Runway 27 EIS, and the Airside Project noise contours ■ Discussion of environmental justice ■ Addition of description of historic properties and parklands within the project impact area and a summary of potential impacts and mitigation (formerly in Chapter 8 of the Airside Project Draft EIS/EIR) ■ Inclusion of a school day/school year noise contour for the Preferred Alternative under the 29M Low Fleet scenario

Table P-1 (Cont'd.)**Airside Project****Comparison between the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR**

Chapter	Airside Project Draft EIS/EIR	Supplemental DEIS/FEIR
7 Cumulative Impacts	■ Assessment of incremental environmental impacts of the alternatives in the context of other airport landside projects ■ Comparison of the interrelationship/independence of Massport's airside and landside initiatives □ Relationship to GEIR □ Relationship to Logan Projects □ Long-term Cumulative Effects □ Construction Impacts	■ Updated construction management plan ■ Quantification of the number of daily and total truck trips (including simultaneous construction activity with the CA/T, other Logan projects, and planned East Boston projects)
8 Preferred Alternative and Mitigation	■ Updated construction management plan. ■ Summary of Delay Reduction ■ Summary of Environmental Impacts ■ Preferred Alternative Impacts and Mitigation ■ Compliance with Cultural Resources Laws ■ Environmental Justice ■ Permits	■ Proposed Mitigation: Massport □ Specific steps to be taken by Massport (and others) to ensure that Worcester, Manchester and T.F. Green/Providence airports work with Logan in a balanced regional air network □ Regular monitoring of peak period airline schedules □ A protocol to monitor PRAS goals adherence □ Sound insulation of homes eligible as a result of the Airside Project □ Progress on working with the air carriers to limit the use of "hushkitted" aircraft □ Reinforcement of unidirectional use restriction on Runway 14/32 □ Provide relocation assistance to affected airfield tenants □ Habitat enhancement for upland sandpiper □ Construction mitigation measures □ Participation in the Clean Air Construction Initiative □ Inclusion of Massport's Draft Section 61 Findings ■ Proposed Mitigation: FAA □ Sound Insulation

Table P-1 (Cont'd.)**Airside Project****Comparison between the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR**

Chapter	Airside Project Draft EIS/EIR	Supplemental DEIS/FEIR
Technical Appendices	A: Airspace Management	A : FAA SDEIS Panel Process
	B: History of Airfield at Logan	B: Regional Transportation
	C: Screening Analysis	C : Delay
	D: Reduced Minimums	D: Evaluation of Northwest Wind Restriction on Unidirectional Runway 14/32
	E: Fleet Forecast	E Noise
	F: Regional Carrier Case Study	F: Air Quality
	G: Cape Cod Community Case Study	G: Wildlife
	H: Runway and Taxiway Delays	H: Cultural Resources
	I: Northwest/Southwest Winds Case Study	I: Environmental Justice
	J: Arrival/Departure Push Case Study	J: Construction
	K: Taxiway Delays Case Study	
	L: Noise	
	M: Air Quality	
	N: Natural Resources	
	O: Construction Noise	

Table P-2**Airside Project****Additional Analyses for the Supplemental DEIS/FEIR**

Task	Action	Location in Document
1 Is a 5,000-foot Runway 14/32 effective given the expected use of regional jets in the future fleet mix?	■ Verify and confirm previous survey of airlines and manufacturers to determine minimum arriving /takeoff distances for regional jet aircraft. ■ Research regional jet aircraft usage and runway length requirements at other airports. ■ Review forecast mix of regional jet aircraft types at Logan. ■ Develop estimate of probable regional jet utilization of a 5,000 foot Runway 14/32.	Chapter 4 and Appendix C
2 Expand Regionalization analysis contained in Interim Supplemental Draft EIS	■ Discuss proposed New England Airports System Study and proposed work scope. ■ Update status of traffic and services at the regional airports, Amtrak's Acela service, and ground access projects. ■ Add historical context and on-going nature of regionalization efforts.	Chapter 2

Table P-2 (Cont'd.)
Airside Project
Additional Analyses for the Supplemental DEIS/FEIR

Task	Action	Location in Document
3 Expand analysis of peak period pricing.	■ Review changes in airline scheduling activity at Logan and assess how and why the demand profile has flattened over time. □ Determine which new airline/markets have contributed to changes in the demand profile. □ Assess whether the flattened profile or a more peaked profile is likely to occur in the new future fleet (37.5M High RJ Fleet).	Chapter 4
	■ Discuss the design of a Peak Period Pricing program that would impact regional jet scheduling practices at Logan. □ Base analysis on 37.5M High RJ Fleet, using an updated demand profile and a small community exemption program. □ 3.2.2 Discuss the economic cost of Peak Period Pricing to the consumer. □ 3.2.3 Discuss the uniqueness of Cape Air and the communities that it serves.	Chapter 4
	■ Identify known, comparable demand management strategies that are in use or have been proposed by other airports.	Chapter 4
	■ Develop 2015 fleet mix and demand profile assuming 37.5M passengers and increased RJ utilization.	Chapter 6
4 What impact does the 2015 Modified 37.5M RJ fleet mix have on delay reduction benefits and environmental impacts?	■ Assess the impacts of the new fleet on delays, runway utilization, noise contours and noise-exposed populations for Alternatives 1, 1A, 2, 3 and 4.	Chapter 4 and Chapter 6
	■ Assess the impacts of the new fleet on ground noise and air quality for Alternatives 1/1A and 4.	Chapter 4 and Chapter 6
	■ Perform delay sensitivity analysis using varying RJ utilization factor for Runway 14/32.	Chapter 4 and Chapter 6
5 Broaden discussion of national delays to put Logan delays into context.	■ Assess Logan's relative national delay ranking if Runway 14/32 was available in 1998.	Chapter 1
	■ Discuss how delays at Logan affect the national air transportation system.	
	■ Discuss measures FAA is pursuing to reduce delays nation-wide.	
6 Analyze potential wind/weather use restrictions on Runway 14/32 and their impact on delay reduction, runway utilization, and PRAS achievement.	■ For the 2015 Modified 37.5M RJ fleet, analyze and compare delay levels and runway utilization patterns for: (1) No Action, (2) Action [a.] As Modeled with PRAS and [b.] with wind/weather restrictions on the usage of Runway 14/32.	Chapter 4 and Appendix D
	■ Determine impact of potential restrictions on utilization of Runways 27 and 33 for departures, PRAS achievement, and ability to reduce population exposed to the highest noise levels.	

Table P-2 (Cont'd.)
Airside Project
Additional Analyses for the Supplemental DEIS/FEIR

Task	Action	Location in Document
7	Present enhanced flight track graphics on the same GIS base map used for the <i>Interim Supplemental Draft EIS</i> noise contours, show individual tracks, extend into the South Shore, and show altitudes.	Chapter 6
8	Incorporate a summary of existing analyses from the Draft EIS for Alternatives 1, 2, and 3 into the SDEIS in addition to the No Action (Alt. 4) and Preferred Alternative (Alt. 1A).	Appendices C, E, F
9	Analyze the potential for proposed infrastructure improvements (Runway 14/32 and taxiway improvements) and Peak Period Pricing to induce demand for Logan Airport.	Chapter 4
10	Compare current measured noise levels from monitors in residential neighborhoods to modeled results from the Integrated Noise Model (INM).	Chapter 6
11	Address the following specific issues for which clarification has been requested: ■ Provide data on predicted change in activity by runway end, including daytime and nighttime distribution. ■ Clarify discussion of proposed Centerfield Taxiway and its impact on the number of aircraft queuing on that and other taxiways while waiting to depart. ■ Respond to written questions submitted by SDEIS Panel member, Mary Ellen Welch.	Chapter 6 Chapter 3 Appendix A
12	Produce a school year/school day 65 dB contour for the Preferred Alternative for the 29M Low Fleet. Research school day operating hours in relevant surrounding communities to determine the appropriate hours for the analysis.	Appendix E

To assist the reader, a list of commonly used phrases and acronyms used in this Supplemental DEIS/FEIR is summarized in Table P-3.

Table P-3
Commonly Used Phrases and Acronyms

Airside Project	Logan Airside Improvements Planning Project
ALP	Airport Layout Plan
CAA	Clean Air Act
CA/T	Central Artery Tunnel Project
dB	decibel
DEP	Massachusetts Department of Environmental Protection
DNL	Day Night Sound Level
DOT	Department of Transportation
Draft EIS/EIR	Draft Environmental Impact Statement/ Environmental Impact Report
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ENF	Environmental Notification Form
EOEA	Executive Office of Environmental Affairs
EPA	Environmental Protection Agency
ESPR	Environmental Status and Planning Report
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
GEIR	Generic Environmental Impact Report
ILS	Instrument Landing Systems
INM	Integrated Noise Model
Logan Airport/Logan	Boston-Logan International Airport
Massport	Massachusetts Port Authority
MBTA	Massachusetts Bay Transportation Authority
MEPA	Massachusetts Environmental Policy Act
MESA	Massachusetts Endangered Species Act
MassHighway	Massachusetts Highway Department
MOU	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NO _x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
PM ₁₀	particulate matter less than 10 microns in size
PRAS	Preferential Runway Advisory System
ROD	Record of Decision
SDEIS Panel	Supplemental Draft EIS Panel
Supplemental DEIS/FEIR	Supplemental Draft Environmental Impact Statement/Final Environmental Impact Report
VFR	Visual Flight Rules
VOC	volatile organic compounds
29M Low Fleet	29 million annual air passenger Low Fleet
37.5M High Fleet	37.5 million annual air passenger High Fleet
37.5M High RJ Fleet	37.5 million annual air passenger High Regional Jet Fleet

Executive Summary

Logan Airside Improvements Planning Project History of Environmental Review Process

This Logan Airside Improvements Planning Project (Airside Project) Supplemental Draft Environmental Impact Statement/Final Environmental Impact Report (SDEIS/FEIR) is jointly prepared by the Federal Aviation Administration (FAA) and the Massachusetts Port Authority (Massport). For the federal environmental review process, this Supplemental Draft EIS has been prepared in response to a decision by the FAA in accordance with the National Environmental Policy Act (NEPA) and its implementing regulations. As a Final EIR, this document has been prepared to satisfy the requirements of the Massachusetts Environmental Policy Act (MEPA) and its implementing regulations.

The state and federal environmental review processes for the Airside Project began in summer 1995, with public comments received and public scoping sessions held during the fall. The Massachusetts Secretary of Environmental Affairs issued a certificate in November 1995 which defined the scope for the Draft EIR, and the FAA issued the scope for the Draft EIS in January 1996.

The combined Draft EIS/EIR for the Logan Airside Improvements Planning Project was submitted to state and federal agencies in February 1999. In accordance with federal and state scoping directives, the Draft EIS/EIR identified and reviewed the operational and environmental implications of various alternatives for increasing airfield efficiency, enhancing safety and reducing current and future levels of aircraft and passenger delay at Logan. A 60-day public comment period on the Draft EIS/EIR ended in late April 1999, and during that period, the FAA held two public hearings on the Draft EIS/EIR.

In addition to the public hearings, an extensive public participation and review process was conducted throughout the preparation and finalization of the Draft EIS/EIR. In an effort to conduct the analysis with awareness of and input from all concerned parties, the Massport Board, in November of 1995, established the Airside Review Committee (ARC) consisting of the Community Advisory Committee (CAC), which includes representatives from 24 communities surrounding Logan and 11 business and industry organizations.¹ The Massport Board funded independent consultants for the CAC to provide the Committee with the capacity to professionally assess the analysis and conclusions of the Airside



¹ Community representatives were appointed by Mayors and Boards of Selectmen from the following communities: Boston, Braintree, Brookline, Cambridge, Charlestown, Chelsea, Dorchester, East Boston, Everett, Hingham, Hull, Jamaica Plain, Melrose, Milton, Quincy, Revere, Roslindale/Hyde Park, Roxbury, Somerville, South Boston, Swampscott, West Roxbury, Weymouth and Winthrop. In addition, the following business and industry organizations were members of the ARC: American Society of Travel Agents - New England, Air Line Pilots Association, Air Transport Association, Aircraft Owners and Pilots Association, Business Express, Cape Cod Economic Development Council, Greater Boston Chamber of Commerce, Greater Boston Convention and Visitors Bureau, Massachusetts High Technology Council, New England Council and the Regional Airline Association.

Project study team. Massport, in conjunction with the FAA, held 16 meetings with the ARC between 1995 and 1999; 15 additional meetings with just the CAC; and multiple meetings with the CAC's technical consultants during the preparation period for the Draft EIS/EIR. Massport also made 29 presentations to elected officials and held 45 meetings with community and business leaders, reaching an audience of more than 3,000 people. The FAA participated in many of these public meetings.

On May 7, 1999 the Massachusetts Secretary of Environmental Affairs issued the Certificate on the Draft EIR for the Logan Airside Improvements Planning Project. In his Certificate, the Secretary determined that the Draft EIR had adequately and properly complied with MEPA and its implementing regulations. The Secretary also found that the Draft EIR presented sufficient information on alternatives, impacts and mitigation to meet the MEPA standard, and should proceed to the stage of a Final EIR. The Secretary directed that the Final EIR address certain important issues adequately respond to the substantive comments received. This Final EIR responds to the issues identified in the Certificate and includes separate volumes containing responses to comments received on the Airside Project Draft EIS/EIR.

In January 2000, in response to the FAA's review of the Draft EIS, the FAA requested the preparation of a Supplemental Draft EIS to address a series of specific issues. At the FAA's direction, a Supplemental Draft EIS Panel (SDEIS Panel) was formed consisting of three members appointed by the Governor of the Commonwealth of Massachusetts and three appointed by the Mayor of the City of Boston. Under the direction of the FAA New England Region, the SDEIS Panel convened in March 2000 and then held 12 meetings and made 5 informational visits to regional airports and the Logan Airport air traffic control tower, with a final meeting in December 2000. (Minutes from the SDEIS Panel meetings are contained in Appendix A). This document reflects the additional analysis requested by the FAA as a result of the SDEIS Panel review process and constitutes the Supplemental Draft Environmental Impact Statement.

Overview

Boston-Logan International Airport (Logan) serves as the primary commercial airport in New England and is the region's most valuable transportation resource. It functions within a large, complex transportation and communications network that includes not only other aviation facilities, but also rail services, highways, and advanced telecommunications. Improvements to any component of the regional transportation network benefit the efficiency of the overall system. Thus, in today's global economy, transportation agencies must engage in cooperative planning to ensure that a region, such as New England, benefits from integrated transportation facilities that will enhance high-speed inter-city travel and contribute to the region's economic success.

Massport and the FAA have long recognized that the advancement of regionally significant transportation initiatives benefits from meaningful discussion and coordination among federal, regional and state transportation agencies. Over the past ten years, a number of

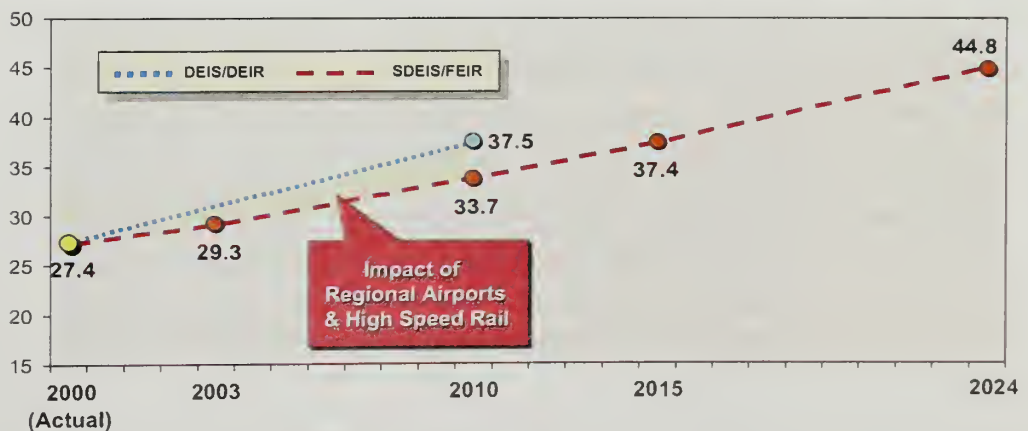
governmental agencies and organizations, including Massport, the FAA, the New England Council, the Council of New England Governors (CONEG), and the New England state aviation directors have undertaken long-term regional transportation planning studies and made substantial investments in capital improvements. All such studies have concluded that New England must strengthen its regional transportation network by developing the regional airports and high-speed rail and making needed infrastructure improvements at each of the individual airports, including Logan.

The development of New England's regional transportation system has already provided significant passenger relief to Logan, reduced air and road congestion and offered travelers better choices closer to home. Travelers are demonstrating the success of this regional approach, as they opt in greater numbers to use the region's alternative airports, when possible, for business and pleasure trips. In fact, in 1999 alone, regional airports diverted an estimated 2.4 million passengers from Logan Airport. Based on the exceptional growth at New England's regional airports, Massport has adjusted its growth projections for Logan. Instead of expecting 37.5 million passengers in 2010, Logan is not expected to reach 37.5 million passengers until 2015 (See Figure ES-1).

Massport and the FAA recognize that regional transportation options can continue to absorb a meaningful portion of the growing demand for Logan air services, and the agencies will continue to pursue additional means to improve the regional transportation network. The vision of Massport and the FAA is to make New England's regional transportation system the most efficient and competitive of any region in the country.

Figure ES-1

Logan Airport Passenger Forecasts: Impact of Regional Transportation Options



However, since demand within Logan's core service area will continue to grow, and Logan will continue to function as the region's principal long-haul and international gateway, regional transportation options will not eliminate the need for the proposed improvements at Logan. Even with the relief provided by the regional airports and the introduction of Amtrak's Acela service, in 2000 Logan was the 2nd worst United States airport in terms of aircraft arrival delays, and ranked 6th overall in total delays. At current activity levels, with no additional passenger traffic or aircraft operations, Logan has reached an unacceptable level of delay. Yet, a significant portion of Logan's delay problem can be solved by correcting a deficiency in the runway system and rectifying inefficiencies and bottlenecks in the airfield's taxiway system. While Logan will always experience delays due to severe weather, the Preferred Alternative virtually eliminates delays that can be controlled, particularly those occurring during northwest winds.

By mitigating the environmental impacts associated with the Preferred Alternative as proposed by Massport, the operational benefits of the proposed improvements can be provided without significant environmental consequences. In fact, by improving airside operating conditions and reducing the amount of time aircraft are delayed in the air or on the ground, the Preferred Alternative actually reduces the environmental impact of aircraft operations. The Preferred Alternative will result in improved air quality over the No Action Alternative; an increase in aircraft operations over water; a greater ability to meet the noise goals of the Preferential Runway Advisory System (PRAS); and reduced noise exposure for the most severely impacted populations in East Boston, Revere and Winthrop.

The Preferred Alternative, Alternative 1A, consists of the following improvements:

- Construction of a new unidirectional Runway 14/32;
- Construction of a Centerfield Taxiway;
- Extension of Taxiway Delta;
- Realignment of Taxiway November;
- Optimization of taxiways in the Southwest Corner of the airfield; and,
- Reduction in approach minimums on Runways 22L, 27, 15R, and 33L.

Peak Period Pricing, an important demand management tool designed to reduce delays that result when airlines schedule beyond airfield capacity limits for a sustained period, was also studied. Since overscheduling is not a significant contributor to delays at Logan at present, Peak Period Pricing is not a recommended component of the Preferred Alternative. However, Massport recognizes the potential benefits of demand management tools such as Peak Period Pricing for reducing delays caused by overscheduling, and is committed to implementing a Peak Period Pricing program as conditions mandate. As part of the Preferred Alternative, Massport has designed a Peak Period Monitoring System for early identification of airline overscheduling conditions that would allow Massport to take remedial action and, if necessary, implement a Peak Period Pricing program at Logan Airport.

Project Purpose and Need

Logan's Role in the Local and Regional Economy

Logan Airport is the gateway to New England, providing a vital link to the national and international air transportation systems. The transportation services provided at Logan Airport – both passenger and air cargo – are essential to the economic success of the entire New England region. In addition to supporting the inter-city travel needs of the region's businesses and facilitating the region's growing tourism trade, Logan Airport itself is a major contributor to the regional economy. More than sixty airlines serve Logan and over 100 aviation-related businesses provide airport support services. Of the 15,000 people who work at Logan, 95 percent are employed by the private sector or by agencies other than Massport. Logan generates jobs and economic activity that stimulate the regional economy by \$5 billion per year, or an average of \$13.6 million daily.²

With New England experiencing a sustained period of strong economic growth, Logan reached a record passenger level of 27.4 million in 2000. As the New England economy grows, demand for Logan services will continue to increase. However, continued growth in the regional economy is threatened by delays at Logan.

Delays at Logan produce substantial costs to airlines, passengers and residents of communities that surround the airport. Airlines experience additional operating costs; passengers miss connecting flights and lose personal or work-related time; and communities experience increased environmental impacts as aircraft queue on taxiways or stack for approach to Logan. In 1998, runway-related delays at Logan are estimated to have cost airlines and consumers more than \$300 million.

Airfield congestion and delays at Logan will become worse if nothing is done. While Massport and the FAA cannot entirely eliminate delays at Logan, they can and must take action to reduce delays where feasible and to increase the efficiency and safety of the airfield. Delays at Logan impact not only passengers traveling to and from Boston, but also propagate through airline route networks, creating delays that are incurred by passengers and airlines in other parts of the national air transportation system. Massport's and the FAA's responsibility to reduce delays is especially compelling when this reduction is joined with a more equitable distribution of noise, providing a clear benefit to residents most severely affected by aircraft noise.

Logan's Airfield Layout and the Causes of Delays

Logan's airfield layout, illustrated in Figure ES-2, consists of five runways, which are used in combinations called runway configurations. The availability of specific runway configurations is determined by prevailing wind and weather conditions. Under normal weather conditions, Logan operates on three-runway configurations that can accommodate approximately 120 operations per hour. These configurations are available nearly 80 percent of the year.



² Massachusetts Port Authority, Economic Impact Report, Fiscal Year 1998.

Delays occur when wind or weather conditions require FAA Air Traffic Control (ATC) to utilize configurations with fewer than three runways, or when poor weather requires increased separation distances between aircraft. Both circumstances produce a significant decline in Logan's airfield capacity. In Boston, ground fog, wind from the northwest, or other strong winds can quickly reduce Logan to one or two active runways, causing delays to compound rapidly. With two runways, Logan's operational capacity declines to 90 or fewer flights per hour; with one runway, which occurs in severe weather or strong northwest wind conditions, Logan's airfield capacity drops to 60 or fewer operations per hour.

Delays can also occur when regularly scheduled demand exceeds the normal capacity of the airport. If flight schedules approach or exceed 120 operations per hour for a sustained period delays will result, even in good weather. While current schedule demand does not exceed Logan's normal airfield capacity, Massport is committed to demand management at Logan and will implement Peak Period Pricing when and if it is warranted by future growth in aircraft activity.

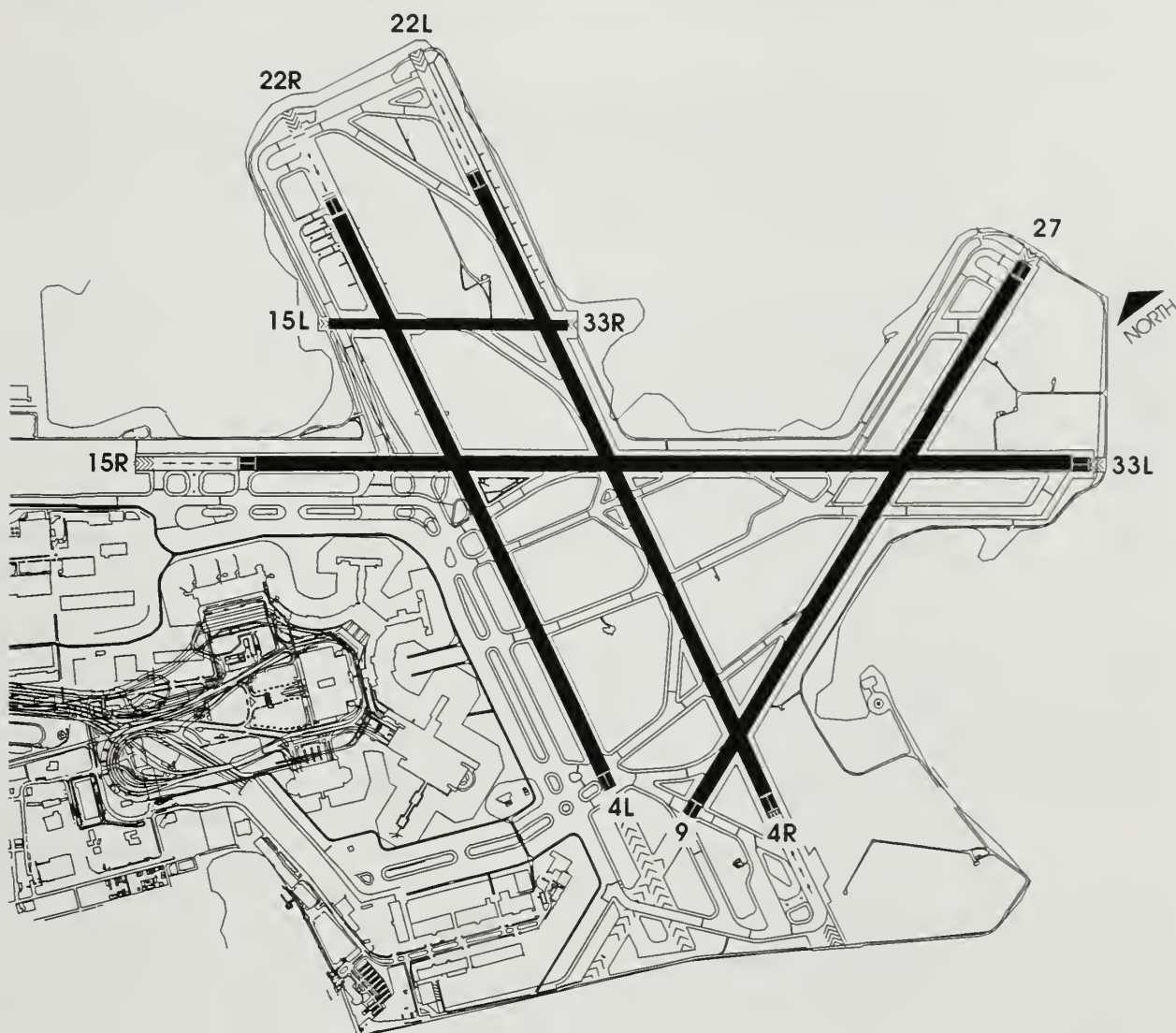
The Role of Regional Transportation Options

For more than a decade, transportation planning studies have recommended a regional transportation strategy for New England that includes an expanded role for the regional airports that surround Logan, high-speed inter-city rail, and airside improvements at Logan Airport. Substantial capital investments and marketing initiatives have increased passenger acceptance and use of regional airport alternatives to Logan Airport. In addition, Amtrak's Acela service now provides Boston-New York passengers with high-speed rail service. These accomplishments will divert considerable air passenger traffic from Logan Airport by reducing the region's reliance on Logan for high-speed, inter-city travel.

Service expansions at T.F. Green/ Providence Airport to the south and Manchester Airport to the north have created viable air travel options in New England. By attracting a substantial level of airline services to short- and medium-haul³ markets, these airports are not only recapturing passengers generated within their own market areas, but are also absorbing demand from the periphery of Logan Airport's core service area. As a result, since 1996 eight out of ten new air passengers in New England used the regional airports, rather than Logan.

Since 1995, Massport has been working with the City of Worcester to market Worcester Regional Airport to air carriers. In January 2000, Massport assumed operating responsibility for this airport, and is committed to developing a critical mass of air services there. Massport has already been successful in attracting several new services to Worcester, including Delta Connection services to Atlanta, American Eagle services to New York JFK, and Pan Am service to Orlando Sanford International Airport. These services and continued air service development efforts will enable Worcester Regional Airport to attract a meaningful share of Logan Airport passengers that originate from central Massachusetts and the Metro West suburbs of Boston.

▼
³ Short-haul services are less than 750 miles, medium-haul services are 750 to 1,499 miles, and long-haul services are greater than 1,500 miles.



RUNWAY LENGTH DATA (feet)

Runway	Landing Length	Takeoff Length	Displaced Threshold
15R	9,201	10,081	880
33L	10,081	10,081	—
4R	8,850	10,005	1,155
22L	8,806	10,005	1,199
4L	7,860	7,860	—
22R	7,045	7,860	815
9	7,000	7,000	—
27	7,000	7,000	—
15L	2,557	2,557	—
33R	2,557	2,557	—

1998 JET RUNWAY USE

Runway	Departure	Arrival
4L	0%	2%
4R	8%	41%
9	35%	0%
15R	6%	2%
22L	5%	7%
22R	28%	0%
27	14%	28%
33L	5%	19%

Logan Airport Layout Plan

Source: 1998 Annual Update



Figure ES-2

Existing Logan Airfield Runway Layout

Massport is equally committed to maintaining the utility of Hanscom Field within the regional transportation system. Hanscom will continue to serve primarily as a general aviation reliever for Logan Airport, with regional carriers operating commercial air services in certain niche markets.

Massport and the FAA support the regionalization of New England's transportation network and continue to work with aviation transportation agencies including the Massachusetts Aeronautics Commission (MAC), the New England state aviation directors, and the regional airports to ensure the efficient use of the region's transportation infrastructure. Massport, the FAA, and the regional airport directors have agreed to undertake an update of the 1995 New England Council Regional Airports Air Service Study. This New England Airports System Study will evaluate the impact of recent regional airport developments on Logan Airport, identify constraints to regional airport growth, and highlight strategies for optimizing New England's regional aviation system.

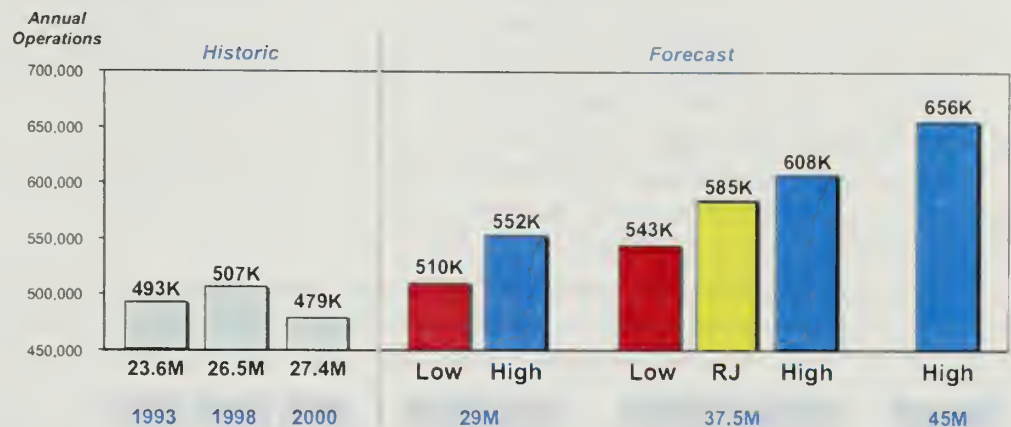
Even with implementation of these aggressive and highly successful regional initiatives, every major regional transportation study has recognized that airside improvements at Logan are critical to the success of the regional transportation system in New England. Logan will continue to function as the region's primary airport, accommodating the core Metropolitan Boston demand, as well as the New England region's demand for international and domestic long-haul travel. The airside improvements that Massport and the FAA have proposed would reduce delays when weather conditions, particularly northwest winds, lower Logan's capacity below its typical capability of 120 hourly operations. While regional airports and rail are essential elements of a balanced and efficient inter-city travel network, they cannot relieve Logan delays that result from northwest winds or inefficiencies in the airport's runway or taxiway layout.

Passenger and Operations Forecasts

In addition to the analysis of historic 1993 conditions presented in the Airside Project Draft EIS/EIR, this Supplemental DEIS/FEIR provides updated historic context by analyzing more recent 1998 conditions. It also includes an additional long-term forecast scenario that reflects recent Logan trends, most notably increases in regional jet activity.

While development of regional transportation options has slowed Logan passenger growth, Logan handled 27.4 million annual passengers in 2000. If the airport remains on its current path, annual passenger demand is expected to reach 29 million passengers in 2003. This passenger level represents the near-term demand against which the proposed airside improvements were evaluated. Over the long-term, Logan is expected to reach 37.5 million passengers in 2015. The proposed improvements were evaluated against this long-term passenger level of 37.5 million. In addition, a higher activity level of 45 million annual passengers, expected in 2024, was also evaluated. Figure ES-3 shows the range of future near- and long-term planning scenarios.

Figure ES-3
Logan Airside Passenger and Fleet Forecasts



Logan's forecast aircraft operations range from 510,000 for the near-term 29 million passenger (29M) Low Fleet scenario to 656,000 for the long-term 45M High Fleet scenario. The High and Low scenarios for aircraft operations at each passenger level reflect different assumptions regarding the aircraft fleet mix at Logan. The Low Fleet scenarios assume more large jet aircraft operations than non-jet operations, similar to current conditions, while the High Fleet scenarios assume a greater proportion of non-jet aircraft and thus a higher level of total operations.

Recent trends within the United States airline industry indicate a rapidly increasing presence of regional jet (RJ) aircraft. To examine the potential impacts that these 30- to 70-seat jet aircraft may have on the Airside Project's operational and environmental findings, an additional long-term 37.5 million passenger scenario was developed. This fleet, referred to as the 37.5M High RJ Fleet, reflects a high number of regional jet aircraft and a corresponding decline in non-jet operations.

Improvement Concepts

In the Airside Project Draft EIS/EIR, consistent with state and federal scoping processes, Massport and the FAA studied and evaluated the following concepts to reduce congestion and delays, and enhance safety at Logan:

- Construction of unidirectional Runway 14/32;
- Construction of a Centerfield Taxiway;
- Extension of Taxiway Delta;
- Realignment of Taxiway November;
- Optimization of taxiways in the Southwest Corner of the airfield;
- Reduction in approach minimums on Runways 22L, 27, 15R, and 33L; and,
- Implementation of Peak Period Pricing.

Unidirectional Runway 14/32

Construction and operation of a 5,000-foot unidirectional Runway 14/32 is designed to address delays during strong northwest winds by providing a third active runway during conditions that now require Logan to operate on one or two runways. All flights using Runway 14/32 would arrive or depart over Boston Harbor. The additional three-runway configuration available with Runway 14/32 would provide controllers the opportunity to distribute impacts more equitably among affected communities, consistent with the PRAS goals.⁴

With the recent growth in regional jet activity and the corresponding decline in turbo-prop operations, the utility of a 5,000-foot runway length has been questioned. However, the FAA evaluated the probable utilization of the runway by regional jets and found that the runway length would be acceptable for most RJ types forecast to operate at Logan. In addition, Logan will continue to have a substantial volume of turboprop and piston non-jet aircraft serving New England's smaller destinations, including Cape Cod, Nantucket and Martha's Vineyard.

Taxiway Improvements

Construction of the 9,300 foot Centerfield Taxiway located between Runways 4L/22R and 4R/22L will reduce taxiway congestion, thereby reducing the possibility of runway incursions and wingtip conflicts, and enhancing the general safety and efficiency of movement on the airfield. By reducing aircraft taxi time, the Centerfield Taxiway also reduces air pollution and noise generated by ground operations.

The other proposed taxiway improvements (extension of taxiway Delta, the realignment of taxiway November, and the optimization of the Southwest Corner of the airfield) are also designed to reduce taxiway congestion and the potential for runway incursions, enhance safety, and facilitate more efficient movement of aircraft between the terminal areas and the runways.

Reduced Approach Minimums

Approach minimums for Runways 15R, 22L, 27 and 33L will be reduced to levels consistent with the capabilities of the present navigational equipment. Greater availability of these runways will enhance safety under adverse operating conditions, reduce reliance on Runway 4R when weather conditions deteriorate, and increase the opportunity to achieve both short- and long-term PRAS goals.

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⁴ Logan's Preferential Runway Advisory System (PRAS) is a set of voluntary targets for FAA runway assignments that were established by Massport, the FAA, and community representatives in 1983. The objectives of PRAS are to reduce noise exposure for highly impacted communities (i.e., those within the 70 and 75 dB DNL contours) by distributing noise impacts in accordance with the runway use goals, to provide short-term relief from continuous aircraft operations over neighboring communities, and to maximize use of over-water aircraft routings.

Peak Period Pricing

Peak Period Pricing is a demand management mechanism designed to reduce delay by eliminating flights during periods when scheduled demand exceeds airfield capacity for a sustained period of time. Peak Period Pricing raises the price of using the airfield during designated peak hours, causing some users to discontinue or reduce peak period operations or shift flights to off-peak hours. While current Logan flight demand can be accommodated under normal operating conditions, overscheduling conditions have occurred in the past and could re-emerge in the future. Peak Period Pricing is not currently in effect at United States airports. However, the FAA and the Port Authority of New York and New Jersey are analyzing Peak Period Pricing as a potential replacement for the interim slot lottery and to provide a long-term solution to overscheduling delays at New York LaGuardia (See Chapter 3).

Alternatives Considered

The individual improvements were combined into a series of alternatives for comparative purposes. In the Airside Project Draft EIS/EIR, Massport and the FAA studied and evaluated the operational and delay reduction benefits and conducted a detailed examination of the environmental impacts of each alternative (See Table ES-1).

Table ES-1
Logan Airside Improvements Alternative Packages

Improvement Concept	PREFERRED ALTERNATIVE				
	Alternative 1	Alternative 1A	Alternative 2	Alternative 3	Alternative 4
	All Actions	All Actions Except Peak Period Pricing	All Actions Except Runway 14/32	No Build	No Action
Runway 14/32	■	■			
Taxiways:					
Centerfield	■	■	■		
Extend Delta	■	■	■		
Realign November	■	■	■		
South West Corner Optimization	■	■	■		
Operational:					
Reduced Minimums	■	■	■	■	
Peak Period Pricing	■		■	■	

The Preferred Alternative

The Airside Project Draft EIR/EIS provided the analytical context for selection of the Preferred Alternative, which reduces current and projected levels of delay and enhances operational safety at Logan. When compared to the other alternatives, Alternative 1A (all actions except Peak Period Pricing), would best accomplish the Airside Project operational objectives in an environmentally responsive manner, and thus presented a clear choice for selection as the Preferred Alternative. Alternative 1A is shown in Figure ES-4 and includes the following improvements:

- Unidirectional Runway 14/32;
- Centerfield Taxiway;
- Improvements to Taxiways Delta, November and to taxiways in the Southwest Corner of the airfield; and
- Reduction in approach minimums on Runways 22L, 27, 15R and 33L.

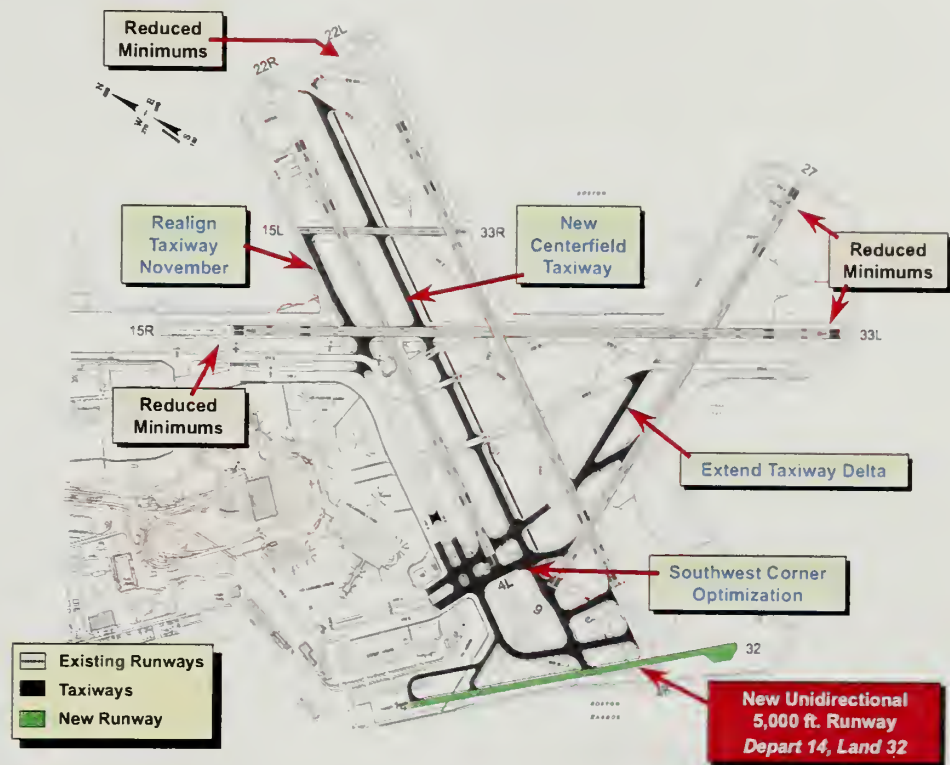
Peak Period Pricing is not included in the Preferred Alternative because airline overscheduling is not currently a problem and the implementation of Peak Period Pricing now would result in costs to airlines and communities without providing clear off-setting benefits. The drawbacks of Peak Period Pricing include reduced access between Logan Airport and other regional airports in New England, and economic penalties to regional carriers and their passengers. If airline overscheduling contributes to Logan delays in the future, Massport is committed to implementing Peak Period Pricing at that time. Massport has designed a monitoring program that will identify when program implementation would be warranted.

The Preferred Alternative achieves significant delay reduction and safety benefits under all future forecast scenarios, reducing total annual delays on Logan's runway and taxiway system by 27 to 31 percent, and Visual Flight Rules (VFR) runway-related delays by 48 to 56 percent, when compared to the No Action Alternative. Alternative 1A was selected as the Preferred Alternative because it will increase airfield operational efficiency; enhance airfield safety; reduce existing and future delays; and accommodate the expected growth in aviation activity that is vital to the regional economy.

With the mitigation program proposed by Massport, the operational benefits of the Preferred Alternative can be provided with minimal environmental impact and certain environmental benefits. In fact, by improving airside operating conditions and reducing the amount of time aircraft are delayed in the air and on the ground, the Preferred Alternative will reduce the environmental impact of aircraft operations. The Preferred Alternative will reduce noise impacts for the most severely affected populations in East Boston, Revere and Winthrop; increase the number of aircraft operations routed over water; and enhance the ability of FAA air traffic controllers to meet PRAS runway utilization goals.

The analysis of the Preferred Alternative is discussed further in the following sections.

Figure ES-4
Preferred Alternative



Delay Modeling Results

State-of-the-art airfield simulation models were used to quantify the levels of delay at Logan under past, current, and future operating conditions. The delay simulation results for each alternative were analyzed in the Airside Project Draft EIS/EIR. For this Supplemental DEIS/FEIR, the analysis was expanded to include delay analysis for 1998 in order to reflect recent operating conditions at Logan. For each forecast scenario, the appropriate baseline analysis is the No Action Alternative (Alternative 4). By comparing the Preferred Alternative to No Action, the operational and environmental benefits and impacts can be measured.

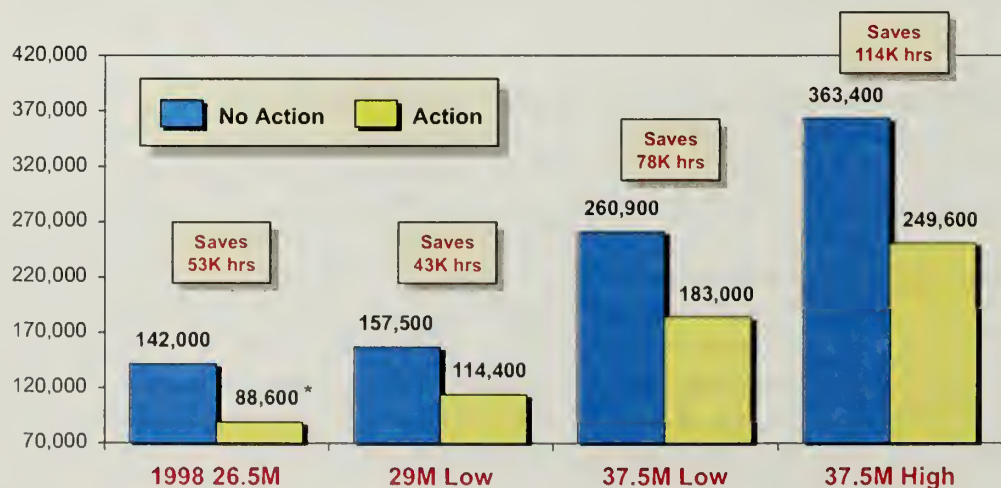
If no action is taken to improve the operating efficiency of the Logan airfield, annual delays will grow from the current level of approximately 142,000 hours to as high as 363,000 hours under the 37.5M High Fleet scenario. With no improvements, average delays will rise from 17 minutes to 36 minutes per flight. Alternatively, implementing the Preferred Alternative will reduce future Logan operating delays by 27 percent in the 29M Low Fleet and by 31 percent in the 37.5M High Fleet, while virtually eliminating delays during northwest wind conditions.

The delay reduction benefits of the Preferred Alternative under the 37.5M High RJ Fleet were analyzed in light of the recent growth in regional jet activity, the corresponding decline in turboprop operations, and the questions these fleet mix changes raised regarding the utility of the proposed runway. The consultant retained by the FAA during the SDEIS Panel process evaluated the probable utilization of the runway by regional jets and found that the proposed 5,000-foot runway length would be acceptable for most RJ types forecast to operate at Logan. The delay modeling conducted by the Airside Study Team incorporated the recommendations of the consultant and found that the Preferred Alternative would reduce annual runway delays by 109,000 hours or 29 percent, compared to the No Action Alternative under the 37.5M High RJ Fleet. This analysis demonstrates the consistent utility of the proposed runway, even under a scenario with high regional jet activity.

The delay reduction impacts of the Preferred Alternative under various fleet scenarios are shown in Figure ES-5.

The availability of Runway 14/32, a central component of the Preferred Alternative, would also provide air traffic controllers with the opportunity to greatly increase the utilization of over-water flight routings, providing relief to the communities experiencing the highest noise impacts.

Figure ES-5
Annual Hours of Delay Reduction and Preferred Alternative vs. No Action



* 1998 Estimated Taxiway Delay Savings Based on Modeled 29M Low Scenario

Environmental Impacts

While this Supplemental DEIS/FEIR examines the full range of environmental impacts associated with the Preferred Alternative, particular attention has been given to the potential for noise, air quality, and environmental justice impacts. These impacts are described below, and the other environmental impacts are summarized at the end of this section.

Noise

Noise impacts depend not only on the number of arriving and departing aircraft associated with a specific fleet forecast, but also on the flight paths that the aircraft follow. Figure ES-6 presents Logan's existing flight tracks, while Figure ES-7 shows the additional flight paths associated with Runway 14/32. Arrivals to Runway 32 come from the harbor over water, while departures from Runway 14 turn to climb out over the water.

While aircraft that use Runway 14/32 ultimately cross over land, these flight paths are considered over-water because the land crossing occurs farther from the airport at higher altitudes, resulting in minimal noise impacts. The closest populated land area overflown by arrivals to Runway 32 is the tip of the Hull peninsula, approximately five miles from the runway end, and well outside of the 65 dB DNL noise contour. In contrast, arrivals to Runways 4L/R and 22L/R fly over populated land areas within one-half mile of the runway ends, extending the noise contours into the communities of South Boston, East Boston, Winthrop, and Revere.

Departures from Runway 14 climb initially over water, with non-jet aircraft vectored by air traffic control and jet aircraft following a track similar to the noise abatement departure procedure for Runway 15R, with an initial left turn after takeoff to head out the mouth of Boston Harbor before turning north or south to cross back over the shoreline. The large majority of these jet aircraft do not cross back over land until they are at or above 6,000 feet, and thus do not impact the noise contours over populated areas.

For the lowest-altitude portions of flights to and from the proposed runway, aircraft will fly over water. In addition, the flight tracks for Runway 14/32 demonstrate that aircraft using Runway 14/32 will not fly over populated areas that are not currently overflown by aircraft utilizing Logan's existing runways.

The Preferred Alternative reduces noise exposure in the communities around Logan that experience the highest noise impacts, i.e., Winthrop, parts of East Boston, and Revere (see Table ES-2). In the 29M Low Fleet scenario, approximately 180 fewer people in these communities are exposed to noise above 75 dB DNL (a 70 percent reduction), with 60 fewer people exposed to 70 dB DNL and above (a four percent reduction). Under the 37.5M High Fleet forecast, there are 200 fewer people above 75 dB DNL (a 77 percent reduction), and 2,800 fewer people in areas of 70 dB DNL and above (a 73 percent reduction).

Table ES-2
Cumulative Noise Exposed Population Summary

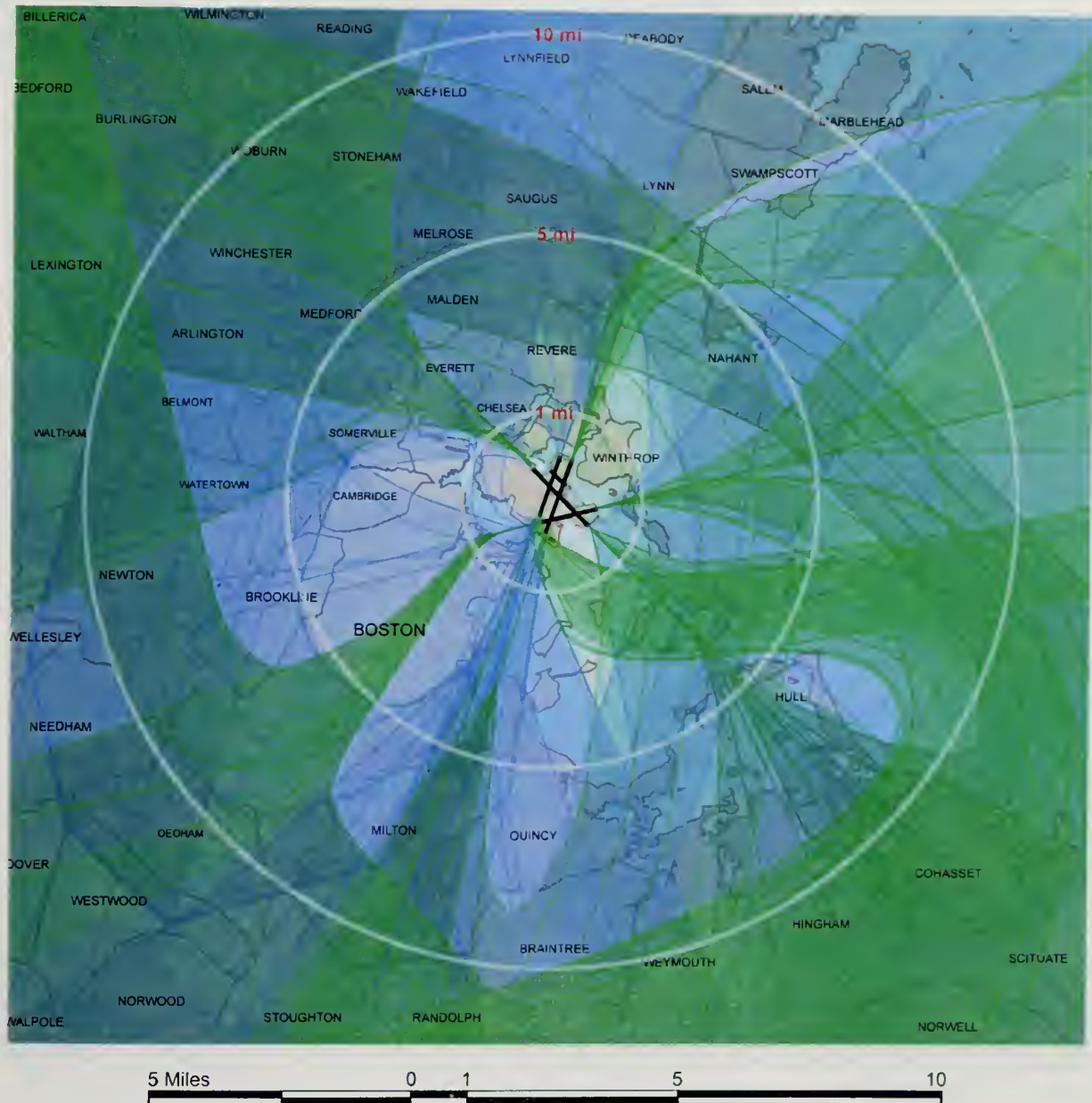
Day-Night Sound Level in dB	1998 Actual Operations	No Action Alternative (Alternative 4)	Preferred Alternative (Alternative 1A)	Preferred Alternative Compared to No Action	Percent Change vs. No Action
29M Low Fleet					
DNL 75 dB and above	577	257	77	-180	-70%
DNL 70 dB and above	2,679	1,521	1,459	-62	-4%
DNL 65 dB and above	23,296	17,531	17,909	378	2%
DNL 60 dB and above	93,860	59,523	60,418	895	2%
37.5M High Fleet					
DNL 75 dB and above	577	257	58	-199	-77%
DNL 70 dB and above	2,679	3,828	1,028	-2,800	-73%
DNL 65 dB and above	23,296	11,499	12,007	508	4%
DNL 60 dB and above	93,860	41,659	52,153	10,494	25%

- 1 Except for 1998, all estimates are based on runway use chosen to most nearly meet PRAS goals and reflect the effects of delayed aircraft as determined by the DELAYSIM model.
- 2 References to 29M Low and 37.5M High fleets do not apply to 1993 or 1998; they are applicable only to Alternatives 1A and 4.
- 3 Where applicable, counts include 502 institutional residents of Long Island in Boston Harbor. None of these individuals is exposed to noise greater than DNL 65 under any of the study scenarios; they do, however, experience DNL values of 60 to 65 dB in some cases but were not previously counted in the Airside Project Draft EIS/EIR or the Logan GEIR and its Annual Updates.
- 4 The federal HUD standard for noise impact analysis is 65 dB DNL. The 60 dB DNL analysis is included at the request of the EOE Secretary.

The reduction in noise exposure at the highest DNL values is achieved by redistributing aircraft onto other runways. This causes increases in exposure at lower DNL values. With the 29M Low Fleet scenario, the Preferred Alternative is estimated to increase the number of people exposed to noise above 65 dB DNL by about 380, or two percent of the total population in that contour compared to the No Action Alternative. With the 37.5M High Fleet forecast, the Preferred Alternative increases the number of people above 65 dB DNL by 508, a four percent increase.

Figure ES-8 illustrates the 60, 65, and 70 dB DNL contours for the Preferred Alternative and the No Action Alternative under the 29M Low Fleet scenario. Figure ES-9 presents similar contours for the 37.5M High Fleet scenario. The 29M Low Fleet scenario most closely resembles current activity at the airport and represents the future analysis scenario with the greatest noise impacts (in terms of population within the 65 dB DNL contour).

By reducing delays, the Preferred Alternative is estimated to reduce the average of number nighttime operations by approximately five percent, compared to the No Action Alternative under the 29M Low Fleet scenario. The Preferred Alternative is even more effective at reducing delays under the 37.5M High Fleet forecast. In that scenario, the number of nighttime operations is reduced by 15 percent, compared to the No Action Alternative.



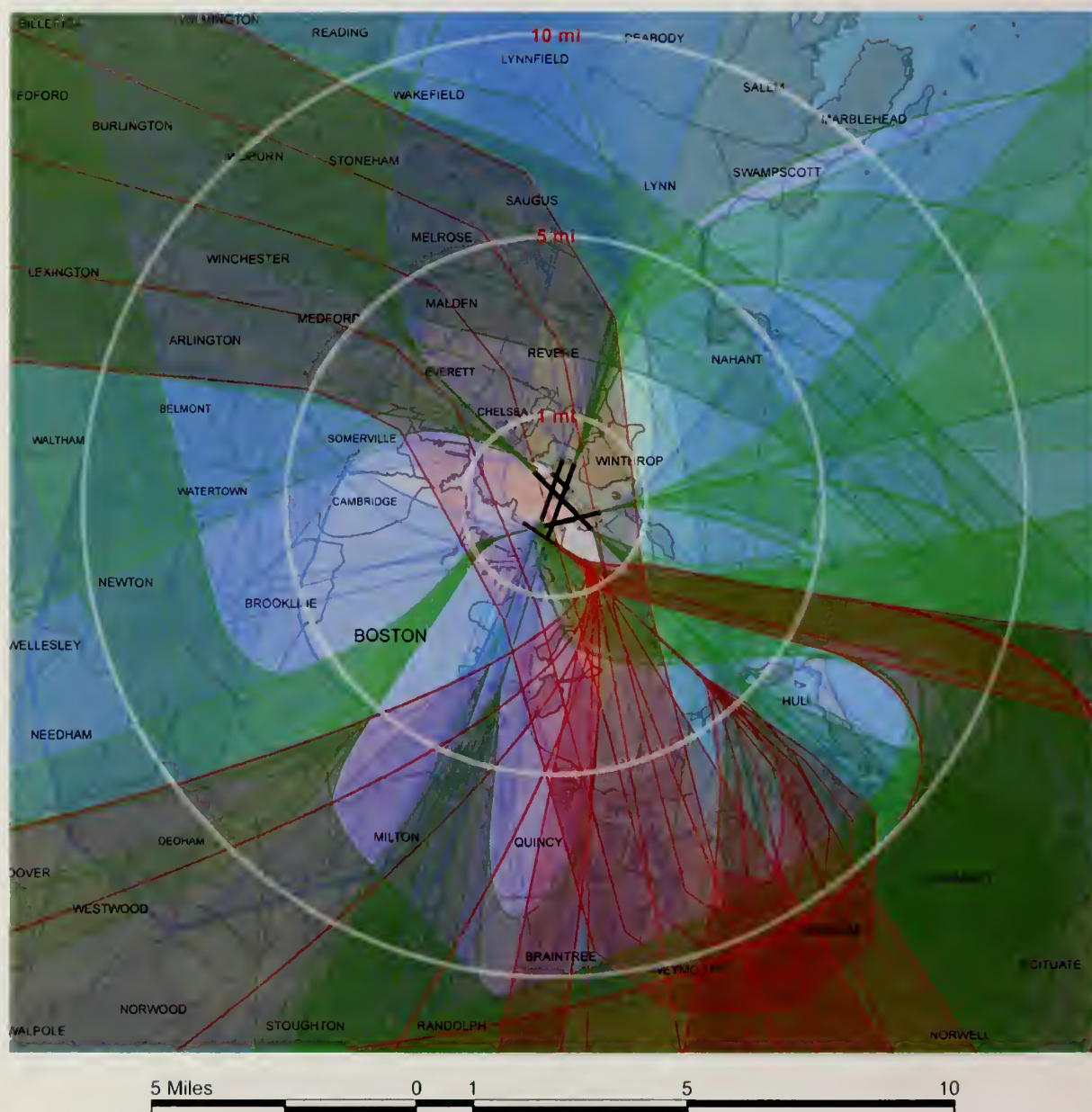
Existing Jet Arrivals and Departures in Green Existing Turboprop Arrivals and Departures in Blue

Note: Mileage rings are for reference only and do not indicate actual distance along the flight path.

Detailed flight tracks, including altitudes, are presented in Chapter 5 (figures 5.2-1, 5.2-2) and Chapter 6 (figures 6.2-1, 6.2-2, 6.2-3 & 6.2-4)



Figure ES-6
Modeled Departure Flight Tracks for Aircraft on All Existing Runways



Existing Jet Arrivals and Departures in Green Existing Turboprop Arrivals and Departures in Blue

Runway 14-32 Arrivals and Departures in Red (Jet and Turboprop)

Notes: Mileage rings are for reference only and do not indicate actual distance along the flight path.
Detailed flight tracks, including altitudes, are presented in Chapter 5 (figures 5.2.1 & 5.2.2) and Chapter 6 (figures 6.2.1, 6.2.2, 6.2.3 & 6.2.4).



Modeled Departure Flight Tracks for Aircraft on All Existing Runways

Figure ES-7



Legend

No Action Alternative 29M Low

 60, 65 and 70 DNL

Preferred Alternative 29M Low

 60, 65 and 70 DNL

Open Space



Census Blocks

 Populated

 Non-Populated

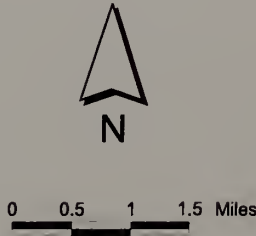


Figure ES-8

Day/Night Sound Levels - 65 and 70 DNL
Contours, 29M Low, No Action and
Preferred Alternatives

Source: Harris Miller Miller & Hanson



Legend

- No Action Alternative 37.5M High
60, 65 and 70 DNL
- Preferred Alternative 37.5M High
60, 65 and 70 DNL
- Open Space
- Census Blocks
Populated
Non-Populated



0 0.5 1 1.5 Miles



Figure ES-9

Day/Night Sound Levels - 65 and 70 DNL
Contours, 37.5M High No Action and
Preferred Alternatives

Source: Harris Miller Miller & Hanson

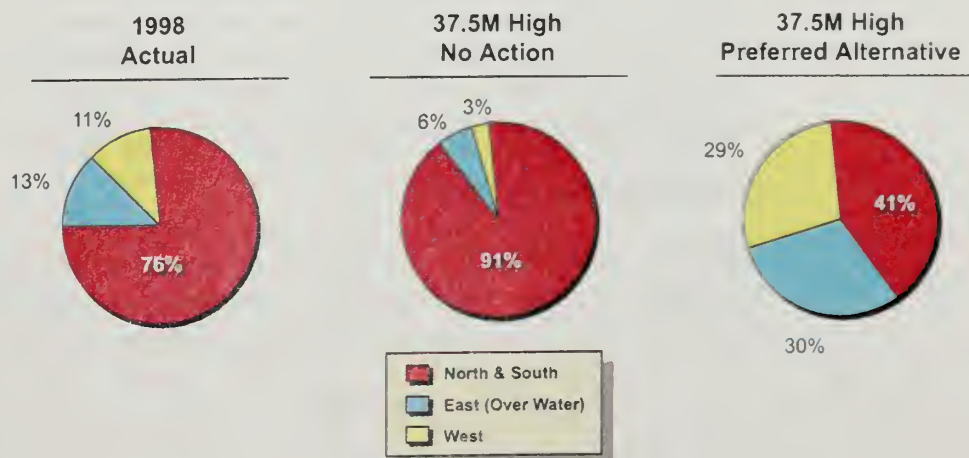
In the 29M Low Fleet scenario, no one residing in an area exposed to noise above 65 dB DNL is projected to experience an increase greater than 1.5 dB (the FAA threshold for defining significant adverse impacts) as a result of the Preferred Alternative. It is significant that approximately 400 people in Winthrop will experience decreases in noise of more than 1.5 dB, compared to the No Action Alternative.

Noise impacts from ground taxi operations are significantly lower than noise impacts from aircraft on the runways and in flight. Nevertheless, the Preferred Alternative generally reduces ground noise by lowering DNL levels due to taxi operations by a few tenths to as much as 3 dB at seven close-in monitoring locations.

The Preferred Alternative will help to better achieve the long- and short-term goals of the Preferential Runway Advisory System (PRAS). The basic objectives of PRAS are to reduce those areas subject to the highest noise exposure levels (i.e., within the 70 and 75 DNL contours); to equitably distribute noise in accordance with annual runway utilization goals; to provide short-term relief from continuous aircraft operations over neighborhoods that are close to Logan; and to maximize the use of over-water aircraft routings. Due to variations in wind and weather and the need to utilize high capacity runway configurations to accommodate demand, historic runway end usage has not met PRAS goals.

In addition to reducing noise exposure at the highest DNL levels, the Preferred Alternative allows for a more balanced geographic distribution of jet operations. With no improvements, the percentage of jets overflying populated areas to the north and south of the airport will increase from 76 percent in 1998 to 91 percent under the 37.5M High Fleet scenario. At the same time, over-water jet flights will decline from 13 percent today to only six percent under the 37.5M High Fleet No Action scenario. With the Preferred Alternative, jet overflights are distributed much more evenly. In the 37.5M High scenario, north/south overflights reach only 41 percent of jet operations, while the percentage of jets flying over the water increases significantly, to 30 percent (See Figure ES-10).

Figure ES-10
Geographic Distribution of Jet Flights at Logan



The FAA Scope of Work for this Supplemental Draft EIS requested an analysis of the benefits of the Preferred Alternative if use of the proposed Runway 32 was limited to northwest wind conditions. Incorporating a northwest wind restriction on Runway 32 would limit the increase in jet departures on Runway 27 that would result from the availability of an additional three-runway configuration at Logan. However, this restriction would sacrifice a portion of the delay reduction benefits provided by the runway, and would also limit the relief provided to communities impacted by the north/south runway configurations, which are already the most heavily utilized at Logan.

Air Quality

Implementation of the Preferred Alternative would produce a reduction in emissions and an improvement in ambient air quality compared to the No Action Alternative. These benefits reflect improved airfield efficiency and shorter delay periods. The Preferred Alternative would not cause emissions to exceed annual General Conformity threshold levels, nor is it a regionally significant action; therefore, the FAA need not make a conformity determination. The Preferred Alternative is presumed to conform to the State Implementation Plan (SIP).

Environmental Justice

Federal environmental impact analysis standards require review and determination to assess whether the proposed project causes a high and adverse environmental impact and, if so, whether this adverse impact falls disproportionately on any low-income or minority populations. The Preferred Alternative does not cause a disproportionate high and adverse impact on minority and low-income populations. Adverse noise impacts of airport operations are not predominately borne by a minority or low-income population. Only 21 percent of the population within the resulting 65 DNL is minority, compared to the Suffolk County minority population of 38 percent. Less than two percent of the population within the 65 DNL contour has a household income of less than 150 percent of poverty level.

The additional area within the 65 DNL contour associated with the Preferred Alternative includes a predominantly Hispanic neighborhood in Chelsea that is predicted to experience an increase of 0.6 dB or less under the near-term 29M Low Fleet – the worst-case scenario based on total noise exposure. Under FAA standards, this change is not considered a significant adverse impact. Furthermore, mitigation of the increased noise will be provided to the affected community in the form of residential sound insulation.

Other Environmental Impacts

Table ES-3 summarizes the other environmental analyses presented in this Supplemental DEIS/FEIR. In most cases, the Preferred Alternative has no significant impact, but when impacts do occur, the proposed mitigation commitment is noted.

Table ES-3
Summary of Other Environmental Impacts of the Preferred Alternative

Impact Category	Summary	Findings
Land Use and Social Impacts	The only relocation required for construction of Runway 14/32 involves the tenants of Building 60 in the South Cargo Area. Massport will provide relocation assistance as required under applicable law to mitigate this impact.	No Significant Impacts
Cultural Resources	The FAA and the State Historic Preservation Officer (Massachusetts Historical Commission) have concurred that the proposed project will not adversely affect significant historic properties. The Preferred Alternative will neither use land from a Section 4(f) resource, nor adversely affect the normal activity or aesthetic value of a public park, recreation area, wildlife refuge or historic site. The Preferred Alternative does not add any new parklands within the 65 DNL contour. The Boston Harbor Islands are already within the No Action 65 DNL contour, while the Arnold Arboretum, Emerald Necklace and Franklin Park are well outside the 65 DNL contour.	No Adverse Effect/ Significant Impacts
Biotic Communities	The Centerfield Taxiway and the Taxiway Delta extension will result in the loss of an area of upland sandpiper habitat. An on-site and off-site mitigation plan will be developed in consultation with the Massachusetts Natural Heritage and Endangered Species Program (NHESP) to mitigate impacts to the upland sandpiper, consistent with aircraft safety. There are no significant impacts to terrestrial vegetation, wetlands or typical wildlife.	Impacts On Upland Sandpiper Habitat Mitigated. No Other Significant Impacts.
Water Quality	Construction of Runway 14/32 and the taxiway improvements will create additional impervious surfaces at Logan, and thus will increase the peak rate of runoff from Logan to Boston Harbor by approximately four percent; however, the general quality of runoff under the Preferred Alternative is expected to be similar to present runoff. The existing water quality in Boston Harbor will not be affected by the construction of the runway or taxiway improvements, therefore there are no adverse water quality impacts. The Preferred Alternative will conform with applicable NPDES permit requirements.	No Significant Impacts
Soils	All soils removed from the project site will be managed in accordance with State regulations and Massport policy to minimize impacts. Appropriate sediment and erosion controls will be employed during construction, and disturbed soils will be re-vegetated.	No Significant Impacts
Construction	Construction of the runway and taxiway improvements will occur on the existing airfield over a five-year phased construction period. Construction will be managed to minimize air, noise, and other impacts to the adjacent community. Construction vehicles will access the airport on designated haul routes via the Ted Williams Tunnel or Route 1A, and thus would not impact local residential streets adjacent to Logan. All increases in noise associated with construction of the Airside Project are less than 5 dB, and therefore are considered to have "no impact" according to FHWA standards.	All Impacts Mitigated

Cumulative Impacts of the Preferred Alternative

The Airside Project improvements focus on reducing aircraft operating delays and enhancing safety. They have independent utility, and will not stimulate, preclude or otherwise impact other development anticipated as part of Massport's landside planning efforts. The Airside Project noise and air quality impact analysis is cumulative because it examines all aircraft operations, both in flight and on the ground. By reducing delays, the Preferred Alternative provides an air quality benefit. In addition, by increasing the ability to meet PRAS goals, the Preferred Alternative provides a significant reduction in noise for the most severely impacted areas. By providing sound insulation to mitigate impacts within the 65 dB contour, the Preferred Alternative provides net long-term benefits. A cumulative air quality benefit is achieved as a result of the net effect of the Airside Project, the Logan Modernization landside projects, and the Central Artery/Tunnel (CA/T) improvements, which all independently produce positive air quality benefits.

Cumulative Construction Impacts

Construction traffic associated with the Preferred Alternative would not add significantly to the existing volume of traffic on the regional highway system. Peak Airside Project truck traffic is estimated to be approximately 184 trips per day.⁵ Construction vehicles associated with the Preferred Alternative represent less than 0.2 percent of the total traffic volume, and will not have a significant impact on the regional highway system.

The increase in noise levels over the ambient noise level as a result of the construction of the Preferred Alternative and the other concurrent construction projects, i.e., construction of the terminal area roadways, International Gateway, and CA/T Contract C08A1, ranges from 0 decibels to 2.1 decibels. According to the Federal Highway Administration (FHWA) noise criteria, increases of less than 5 dBA are categorized as "no impact."

The standard construction mitigation measures developed for the Logan Modernization Program, as well as work on the airfield, will be applied to minimize construction noise and air quality impacts.

Summary of Mitigation

Massport's project-specific mitigation program addresses potential adverse environmental impacts associated with the Preferred Alternative.

Runway 14/32 will be designed, constructed and operated to handle over-water operations only (unidirectional use). Massport will light, mark, and instrument the runway to accommodate unidirectional operations. Massport's commitment to unidirectional use will be reflected in its Section 61 Findings and FAA's related determination. The FAA's commitment will be set forth in its Record of Decision (ROD).



⁵ 92 round trips equal 184 total trips.

The proposed sound insulation program will include all residences that are newly included within the Preferred Alternative's 65 dB DNL contour for the near-term 29M Low Fleet. Implementation of the Preferred Alternative will accelerate and expand Massport's sound insulation program to include residences that would not otherwise be eligible.

Relocation assistance as required by law will be provided to eligible tenants of Building 60.

The potential loss of the state-listed upland sandpiper habitat will be mitigated by altering airfield mowing procedures, implementing an on-airfield reconnaissance program and enhancing off-site habitat.

During the construction period, an extensive array of traffic, air quality and noise mitigation measures will be employed to mitigate temporary construction impacts.

Since the publication of the Airside Project Draft EIS/EIR, Massport has identified a number of additional mitigation commitments including:

- A PRAS monitoring system in order to gather data and report on actual achievement of PRAS goals. The objective of this system is to improve the FAA's opportunity to achieve PRAS goals and provide a broader platform for disclosure of the monitoring results.
- Implementation of a Peak Period Monitoring system to determine when airline overscheduling becomes a significant contributor to delays. Under these conditions, Massport will initiate a Peak Period Pricing Program at Logan.
- Massport will propose a community exemption program for Peak Period Pricing that will reduce the expected degree of service disruption to communities that rely on Logan for access to the national transportation system, without undermining the program's delay reduction benefits. Consideration will also be given to operational factors, such as the use of the 2,557 foot Runway 15L/33R, that may justify exemptions without jeopardizing the delay reduction benefits of Peak Period Pricing. These exemptions would be incorporated as part of any Peak Period Pricing program that may be implemented in the future.
- While not related to Airside Project impacts, Massport will continue discussions with the airlines with the goal of reducing the use of hushkitted Stage 3 aircraft at Logan. Massport will report on the status of these consultations in the next Environmental Status and Planning Report (ESPR).

Key Findings of the Logan Airside Improvements Planning Project Analysis

- Logan plays a critical role in the New England regional economy and must continue to function as the long-haul and international gateway for the regional as a whole, while still meeting the short- and medium-haul needs of its immediate market area. Logan itself generates an estimated \$1.4 billion in annual economic impact resulting from on-airport activity, and induces an additional \$3.6 billion of activity in the regional

economy. In addition, the air services provided at Logan are a necessary catalyst for the region's leading edge economy.

- Logan suffers from a serious delay problem and is consistently ranked among the most delayed airports in the country. In 2000, Logan was the 6th most delayed airport in the United States in terms of total delays. Logan fared even worse in arrival delays, ranking as the 2nd most delayed airport in the nation.
- Logan generally operates on three active runways, with a capacity of approximately 120 operations per hour during good weather. These configurations are available approximately 80 percent of the year.
- Delays occur primarily when wind or weather conditions require the use of configurations with fewer than three active runways, or when poor weather requires increased separation distances between aircraft.
- Currently, aircraft flying to and from Logan experience approximately 142,000 hours of delay caused by circumstances at Logan—120,000 annual hours of delays related to the runway system, and an additional 22,000 hours of delay on the airport taxiways.
- With Runway 14/32 available, current annual runway delay hours would be reduced by 32 percent, and Visual Flight Rules (VFR) delays occurring during northwest winds would be reduced by 87 percent, or virtually eliminated.
- By eliminating constraints and bottlenecks in the taxiway system, the Preferred Alternative, and specifically the proposed Centerfield Taxiway, will eliminate 26 to 47 percent of ground delays in the long-term fleets. In addition, the modifications to the taxiway system would result in enhanced safety for aircraft moving about the airfield, and thus reduce the potential for runway incursions.
- The Draft EIS/EIR evaluated the delay and environmental impacts associated with five different future fleets and two historic fleets. For this Supplemental DEIS/FEIR, an additional future fleet scenario, which is characterized by a substantial volume of regional jet (RJ) aircraft and a reduced number of non-jet operations, was evaluated. This High RJ Fleet was analyzed to address questions about the utility of the proposed runway under conditions of high regional jet growth. Based on the FAA's analysis that the 5,000 foot runway would be adequate for most of the regional jet types that are forecast to operate at Logan, the delay modeling indicated that Runway 14/32 would reduce runway delay by 29 percent under the 37.5M High RJ scenario.
- Airside improvements to enhance the efficiency, reliability, and safety of Logan are necessary in order to maintain Logans' unique function in the regional transportation system. Massport and FAA are also committed to promoting a greater role for regional airports and high-speed rail. Over the past several years, the availability of aviation services has expanded on a regional basis. Both the T.F. Green/Providence and Manchester airports have experienced exceptional growth since 1996. By attracting substantial levels of airline service in short- and medium-haul markets, these airports are not only recapturing passengers from their own service areas, but are also diverting demand from the periphery of Logan Airport's core service area. Eight out of ten new air passengers in New England are using the regional airports

rather than Logan. This is a complete reversal of the historic pattern, in which eight out of ten new air passengers chose Logan.

- With Massport's takeover of the operations of Worcester Regional Airport and the success of Manchester and T.F. Green Airports, a four-airport regional system has been established, offering alternative airports to Logan in all directions. This provides air carriers, general aviation users, and passengers with more choices for selecting competitive aviation services. Massport's aggressive marketing program for Worcester Regional Airport has successfully attracted several new carriers to the airport, including Delta Air Lines, American Airlines and Pan Am.
- The rapid emergence of effective regional transportation options, including Amtrak's Acela high speed rail service to New York, resulted in Massport extending the period when Logan is expected to reach 37.5 million passengers, from 2010 to 2015. Although Logan's air passenger growth has slowed, it continues to be plagued with unacceptable levels of delay. Only the proposed Airside Project Preferred Alternative will relieve delays at Logan that result from northwest wind conditions or inefficiencies in the taxiway system.
- The Preferred Alternative will effectively reduce delays without causing significant negative environmental impacts. In fact, unidirectional Runway 14/32 will produce environmental benefits by maximizing use of over-water routings and distributing noise impacts more equitably across communities. If Runway 14/32 were available today, nearly 50,000 jet aircraft operations would have been shifted from flight tracks that overfly communities to over-water routings. More jets would have flown over water than over any individual community.
- The Preferred Alternative will reduce the population exposed to the most severe noise impacts (70 dB day-night sound levels (DNL) and higher) by four percent, but it will increase the population in the 65 dB DNL contour by two percent, compared to the No Action Alternative. The FAA and Massport have committed to provide sound insulation for all residences within the Preferred Alternative 65 dB DNL noise contour for the 29M Low scenario.
- The lack of a third available runway in the northwest operating direction causes an unbalanced geographic distribution of jet operations at Logan Airport. Approximately three-quarters of Logan's jet flights currently overfly communities to the north and south of the airport. Under high demand scenarios, Logan's reliance on north/south runways will increase to over 90 percent. Runway 14/32 will reduce Logan's reliance on north/south runways to only 41 percent. The proposed runway permits greater achievement of the PRAS goals by increasing controller flexibility, which provides a benefit under any preferential runway system that seeks to more equitably distribute noise impacts.
- There is no disproportionate high and adverse impact caused by the Preferred Alternative to low-income or minority populations.

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Project Background, Purpose, and Need

Key Points

In 2000, Boston-Logan International Airport (Logan), the nation's 18th busiest airport, handled 27.4 million air passengers with 479,000 aircraft operations. Logan suffers from a serious aircraft delay problem and is consistently ranked among the most delayed airports in the country. Current delays at Logan are principally attributable to adverse wind and weather conditions that can produce a significant decline in Logan's airfield capacity. Logan is the 6th most delayed airport in the nation and, because of a limitation in the existing runway layout, it fares even worse in arrival delays, ranking as the 2nd most delayed airport in the nation. Logan's delay problem will only worsen as future levels of aircraft operations grow.

Chapter 1 of the *Airside Improvements Planning Project Draft Environmental Impact Statement/Environmental Impact Report* (Airside Project Draft EIS/EIR)¹ together with Chapter 1 of this Supplemental Draft Environmental Impact Statement/Final Environmental Impact Report (Supplemental DEIS/FEIR) provides the purpose and need for the Airside Improvements Planning Project (Airside Project). In response to a number of substantive comments on the Airside Project Draft EIS/EIR, including those of the Federal Aviation Administration (FAA), the SDEIS Panel² and the Secretary of the Executive Office of Environmental Affairs (EOEA), this chapter provides historic context for Logan's delay problem; compares Logan to other major US airports; and provides a more comprehensive discussion of delays. This chapter broadens the discussion of delays to include not only those that are caused by Logan, but also those incurred by Logan passengers but caused by conditions at other airports. At the FAA's direction, based on input received from the SDEIS Panel, this chapter also assesses the effect that the availability of proposed Runway 14/32 would have had on Logan's current national delay ranking.

- Logan currently experiences approximately 142,000 annual hours of delay (120,000 hours runway delay and 22,000 hours taxiway delay), which is more than seven times the FAA's threshold for congestion.
- Logan delays are estimated to cost airlines and passengers more than \$300 million annually.
- There are multiple causes of aircraft delays at Logan and nationwide. Solving such a complex problem requires a multifaceted solution. There is no single measure that will



¹ *Logan Airside Improvements Planning Project Draft EIS/EIR*, prepared by Massport and the FAA, February 1999.

² In January 2000, in response to the FAA's review of the Draft EIS, the FAA called for preparation of a Supplemental Draft EIS. At the FAA's direction, a Supplemental DEIS Panel was formed. The panel consisted of three members appointed by the Governor of the Commonwealth of Massachusetts and three members appointed by the Mayor of the City of Boston.

resolve all aircraft delays at Logan. Each cause of delay requires a unique solution and no single solution diminishes the need for other solutions.

- The principal cause of delay at Logan is the substantial drop in airfield capacity that occurs when wind and weather conditions force air traffic controllers to utilize configurations with fewer than three runways.
- Further, the lack of a third available runway in the east-west operating direction causes an imbalance in the geographic distribution of jet operations at Logan. Approximately three-quarters of Logan's jet flights overfly communities impacted by use of north and south runway configurations. Under high demand scenarios, if no actions are taken, Logan's reliance on north/south runway configurations will increase to over 90 percent. The proposed new runway (Runway 14/32) would allow for a more balanced distribution of future operations, with 41 percent in the north/south directions, 29 percent to the west and 30 percent over the water.
- The following solutions to ease airside delays at Logan are proposed:
 - Construct unidirectional Runway 14/32 to address one of the major causes of delay, strong northwest winds, by providing a third active runway in conditions that now require Logan to operate on two or fewer runways. This runway will provide a second arrival stream and prevent the decline in airfield capacity that currently occurs. All flights using the new Runway 14/32 will arrive or depart over Boston Harbor, and the additional three-runway configuration will provide an opportunity for better achievement of the long-term and short-term Preferential Runway Advisory System (PRAS)³ goals that are designed to equitably distribute impacts among affected communities.
 - Construct taxiway improvements to reduce taxiway congestion and the potential for runway incursions, thereby enhancing the general safety of airside operations. The taxiway improvements will facilitate more efficient movement between the terminal areas and the runways during takeoff and landing procedures and will reduce the associated levels of aircraft delay.
 - Reduce approach minimums for Runways 15R, 22L, 27 and 33L to increase the availability of these runways, reduce reliance on Runway 4R in low visibility and enhance safety under adverse operating conditions. The Runway 22L and Runway 27 minimums will be reduced to levels consistent with the capabilities of the existing electronic navigational equipment, while approaches to Runways 15R and 33L will be upgraded to Category III Instrument Landing Systems (ILSs).
 - Promote increased utilization of regional airports and highspeed rail to accommodate a greater share of the region's intercity travel demand.

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The Preferential Runway Advisory System (PRAS) is a computer program that recommends to the FAA air traffic controllers runway configuration options that will meet weather and demand requirements, while providing an equitable distribution of the airport's noise impacts. The primary objectives of PRAS are to distribute aircraft operations in accordance with annual runway utilization goals, and to provide short-term relief from continuous operations over the same neighborhoods.

- In addition to project-specific mitigation, Massport has developed other mitigation commitments including:
 - To address possible delays caused by airline overscheduling, Massport has designed a Peak Period Monitoring System and is committed to initiating a Peak Period Pricing program when and if it is needed.
 - Massport and the FAA cannot entirely eliminate delays at Logan. However, by correcting a shortcoming in Logan's existing airfield layout and by closely monitoring and managing demand, they can significantly reduce delays at Logan.

1.1 Purpose and Need

By all accounts, the air transportation industry is currently suffering from a record number of flight delays. According to the US Department of Transportation (US DOT), 27.4 percent of airline flight arrivals in 2000 were delayed by more than 15 minutes, and Logan was one of the most delayed airports in the nation.⁴ According to FAA statistics, Logan was the 6th worst US airport in terms of total delays and the 2nd worst in terms of arrival delays.⁵

The national delay problem is so severe that it threatens the nation's productivity and undermines economic growth. According to the US Secretary of Transportation, "One of the greatest challenges faced by the Department of Transportation, the FAA and the commercial aviation industry is to close the gap between demand for air transportation and the capacity of our current infrastructure. We cannot afford to delay the work."⁶ He also commented that the nation's air transportation system faced gridlock in the year 2000, and that while there is no quick fix to the problem of aviation congestion, airlines, airports, and air traffic control must work together to develop innovative solutions.

The Airside Project identifies physical improvements and actions that address very specific causes of delay at Logan Airport. The improvement concepts that were evaluated in the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR are summarized in Table 1.1-1. Proposed airside improvement concepts are designed to enhance Logan's operating efficiency and safety by reducing current and projected runway and taxiway delays.

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4 US DOT, Air Travel Consumer Report, December 2000.
 5 FAA, 2000 OPSNET data. (See Section 1.4.1)
 6 U.S. Secretary of Transportation Norman Y. Mineta, Remarks before the US Chamber of Commerce, February 2, 2001.

Table 1.1-1
Purpose of Airside Improvement Concepts

Improvement Concept	Purpose
Construct Unidirectional Runway 14/32	Reduce Northwest Wind Delays
Peak Period Pricing	Reduce Overscheduling Delays
Construct Centerfield Taxiway	Reduce Taxiway Delays, Enhance Safety
Extend Taxiway Delta	Reduce Taxiway Delays, Enhance Safety
Realign Taxiway November	Simplify Taxiway System, Enhance Safety
Optimize Southwest Corner Taxiways	Reduce Taxiway Delays, Enhance Safety
Reduce Approach Minimums on Runways 22L, 27, 15R and 33L	Provide for Safer Instrument Approaches

As the gateway to New England, Logan plays a vital role in the region's current and future economic prosperity by ensuring fast and efficient access to the global marketplace. Delays at Logan cause an estimated \$300 million in unnecessary costs to airlines and air passengers annually. In 2000, Logan accommodated 27.4 million passengers, representing more than 60 percent of all New England air passengers. Logan is the 18th busiest US airport based on passenger volume and the 12th busiest based on aircraft operations (arrivals and departures).⁷

The aircraft delays that plague Logan hamper the airport's ability to provide efficient and reliable access to national and world markets and threatens the region's long-term economic success.

The Airside Project Draft EIS/EIR analysis demonstrated that a large portion of the aircraft delays at Logan are avoidable and can be eliminated by correcting a limitation in the airport's existing runway layout. Approximately one-fourth of the annual aircraft delays at Logan occur during periods of northwest winds. While Massport and the FAA cannot resolve certain causes of delay, such as inclement weather, they can act to reduce delays that occur in northwest wind conditions by improving Logan's airfield layout. Most often, Logan is able to operate on three-runway configurations that can accommodate approximately 120 operations per hour. However, moderate to strong northwest winds can restrict the airport to low-capacity configurations with two or fewer runways that accommodate only 60 to 90 operations per hour. When these configurations are in use, Logan cannot accommodate normal levels of demand without incurring serious delays.

The proposed unidirectional Runway 14/32 is designed to increase the reliability of Logan Airport by preventing the decline in capacity that occurs during northwest winds. By allowing Logan to maintain its normal operating capacity, Runway 14/32 would significantly reduce these preventable delays.



7 Airports Council International, *Worldwide Airport Traffic Report*, July 2000.

Delays at Logan can also accrue when airlines schedule beyond the airport's normal runway capacity (120 operations per hour). In the early 1990s, airline overscheduling was a significant source of flight delays at Logan. At that time, Massport seriously considered establishing a peak period pricing program to eliminate airline overscheduling and related flight delays. However, these conditions subsided when one of Logan's three major regional airlines ceased operations, producing an immediate reduction in flight volume.

Logan does not currently suffer from airline overscheduling. However, Massport recognizes that overscheduling conditions could re-emerge in the future and exacerbate Logan's delay problem. The Airside Project analysis includes an evaluation of Peak Period Pricing as a delay reduction measure across a range of future operating conditions (see Chapter 4). The analysis indicates that Peak Period Pricing would be effective in reducing delays when the airport suffers from airline overscheduling. However, Peak Period Pricing would not address delays caused by northwest winds. Massport has designed a Peak Period Monitoring System to identify overscheduling conditions and would initiate a Peak Period Pricing program if and when conditions warrant such action.

In addition to improvements that are designed to relieve airside delays, Massport and the FAA examined potential improvements to Logan's complex taxiway system. The proposed taxiway improvements would increase airfield efficiency and decrease taxiway delays by simplifying the existing taxiway system. The taxiway improvements would also enhance safety by reducing the risk of runway incursions.

The Supplemental DEIS/FEIR focuses on the comparison of the Preferred Alternative (Alternative 1A) to the No Action Alternative (Alternative 4) for two of the fleets that were analyzed in the Airside Project Draft EIS/EIR.⁸ Table 1.1-2 summarizes the combinations of improvement concepts, or "project alternatives," that were evaluated under five future fleet scenarios in the Airside Project Draft EIS/EIR. This Supplemental DEIS/FEIR focuses the analysis on the 29M Low Fleet, the 37.5M High Fleet, and the additional 37.5M High Regional Jet (RJ) fleet, which is evaluated for all Project Alternatives.

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Appendices C, E and F of this Supplemental DEIS/FEIR contain the operational and environmental results for the full set of alternatives which were described in detail in the Airside Project Draft EIS/EIR

Table 1.1-2
Logan Airside Improvements Alternative Packages

	Alternative 1 All Actions	Alternative 1A All Actions Except Peak Period Pricing	Alternative 2 All Actions Except Runway 14/32	Alternative 3 No Build	Alternative 4 No Action
IMPROVEMENT CONCEPT		PREFERRED ALTERNATIVE			NO ACTION ALTERNATIVE
Runway 14/32	■	■			
Taxiways:					
Centerfield	■	■	■		
Extend Delta	■	■	■		
Realign November	■	■	■		
South West Corner Optimization	■	■	■		
Operational:					
Reduced Minimums	■	■	■	■	
Peak Period Pricing	■		■	■	

After careful review in the Airside Project Draft EIS/EIR of the extent and causes of delays at Logan and the comparative benefits of each alternative, Alternative 1A was selected as the Preferred Alternative because it would significantly reduce delay without imposing unnecessary economic costs on regional carriers and New England communities adversely affected by Peak Period Pricing. Additionally, the Preferred Alternative would achieve certain environmental benefits, including improved air quality and a reduced noise exposure for the most severely affected communities, while causing minimal environmental impacts, all of which would be mitigated.

In the Airside Project Draft EIS/EIR, Chapter 1 served as an introduction and provided the foundation for the project's purpose and need. In this Supplemental DEIS/FEIR, Chapter 1 summarizes the project purpose and need and clarifies the issues of delay and the extent of Logan Airport's delay problem. Specifically, this chapter contains a more comprehensive discussion of airport delays, provides historical context for Logan's delay problem, and compares Logan's performance to other major US airports.

This analysis further confirms the need for the Preferred Alternative. This chapter also presents additional analyses identified by the FAA as a result of the SDEIS Panel process. These include a discussion of delays at Logan that are caused by other airports and the delay reduction benefits that Runway 14/32 would have produced if the runway had been operational in 1998.

1.2 How Logan Operates

Airfield capacity is a function of airport design (the number and direction of runways and taxiways, runway instrumentation, etc.), weather conditions (visibility and wind

direction), aircraft mix (heavy, large, small), and FAA Air Traffic Control (ATC) procedures that govern the sequencing and spacing of aircraft. Thus, even for a given airfield layout, capacity is a dynamic factor that varies with changes in wind direction, weather conditions and the mix of arriving and departing aircraft.

1.2.1 The Airfield Layout

Logan's airfield layout, illustrated in Figure 1.2-1, consists of five runways, which vary in length from 2,557 feet to 10,081 feet.⁹ Logan's runways are aligned in three directions with runway ends pointing toward six distinct compass headings. Aircraft must generally takeoff and land into the wind, so the availability of specific runway configurations is determined by wind speed and direction, and other weather conditions. The runway layout provides necessary operating flexibility given Logan's coastal location and highly variable wind conditions. Non-coastal airports that do not experience the same variation in wind conditions generally have a simpler airfield layout and fewer required operating configurations.

1.2.2 Runway Use Configurations

While Logan has five runways, typically no more than three runways can be used concurrently. Delays occur when only low capacity configurations (i.e., less than three active runways) are available and flight demand exceeds available capacity. To operate efficiently under all wind directions, Logan requires three active runways for most of the operating day.

There are several primary runway configurations in use at Logan, with over 80 operating subsets of these configurations. As described in the Airside Project Draft EIS/EIR, the operational capacities of Logan's existing configurations range from a maximum of approximately 120 operations per hour when the weather is good, winds are light, and three runways are available, to fewer than 60 hourly operations for a single runway.

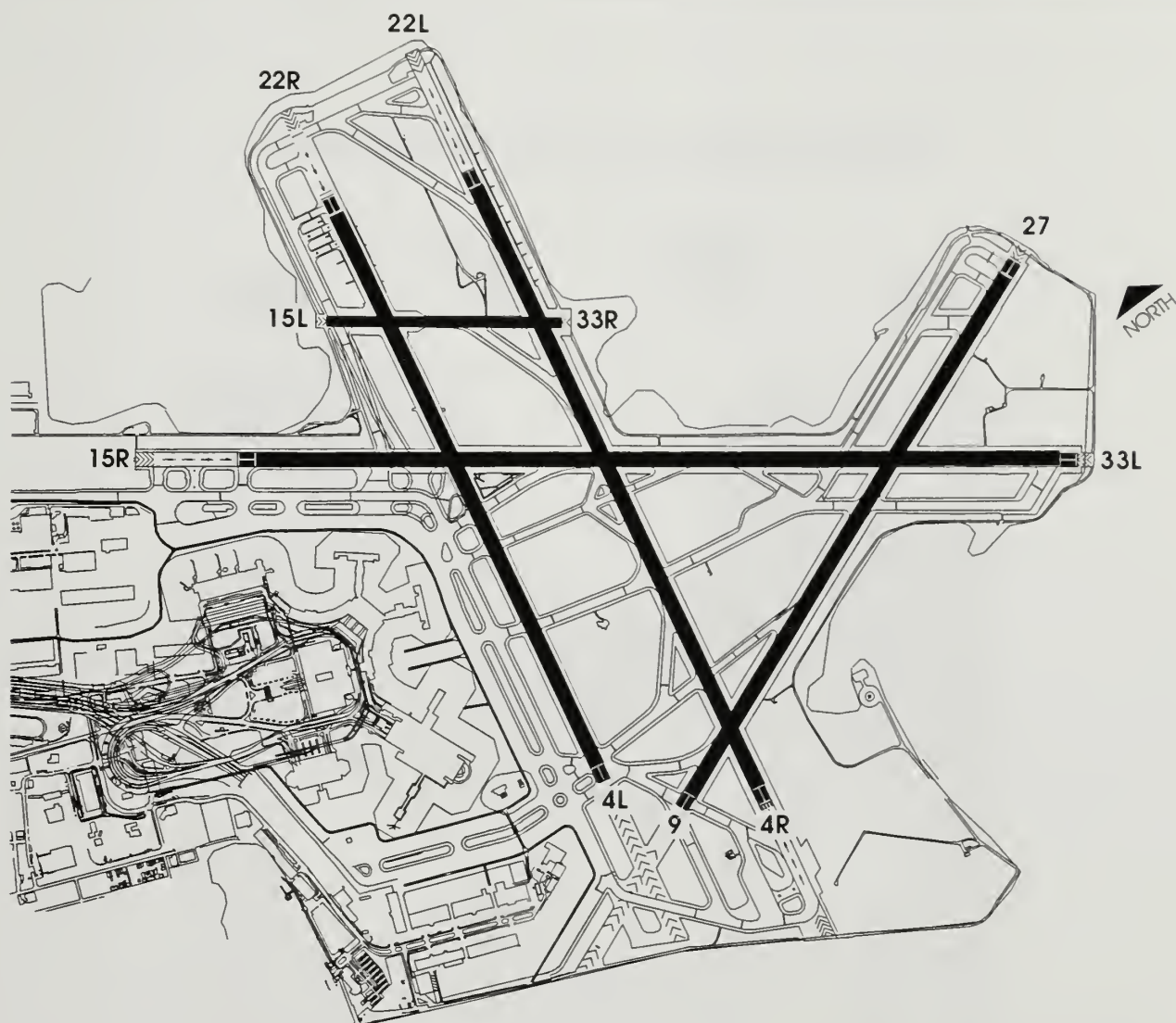
Logan's highest capacity configurations have three active runways which allow FAA controllers to segregate arriving aircraft of different size classes into two arrival streams and to use the third runway for aircraft departures. High capacity runway configurations are available at Logan nearly 80 percent of the year. For the remaining part of the year, poor wind and weather conditions restrict the airport to low capacity configurations with just one or two available runways.



⁹ Logan's shortest runway, Runway 15L/33R, has very limited utilization and can only be used by the smallest-sized aircraft, e.g., Cessna 402s with 9 seats.

As shown in Figures 1.2-2 to 1.2-3, the north-south configurations are the highest capacity configurations at Logan. These configurations include the Runways 4L, 4R, and 9 configuration and the Runways 22L, 22R, and 27 configuration. With three available runways, these configurations maximize the airport's operating efficiency by providing two runways for arriving aircraft, which permits air traffic control to segregate aircraft of different size classes. Conversely, when the airport is restricted to a two-runway or one-runway configuration with a single arrival stream, this type of segregation cannot occur. As shown in Figures 1.2-4 to 1.2-6, Logan is restricted to two or one runway when operating in an east/west orientation. These low capacity configurations include the east/southeast configuration of Runways 15R and 9, and the west/northwest configuration using Runways 27 and 33L. Under very strong northwest winds, Logan can be restricted to just a single runway, Runway 33L, to handle all arriving and departing aircraft.

Because Logan lacks a third available runway in the east-west direction and Runway 15L/33R is too short to be used by most aircraft, the north-south runway configurations are utilized most frequently (see Figure 1.2-7). In 1998, 76 percent of Logan's jet operations landed on or departed from the north/south runway configurations (Runways 4L and 4R arrivals, 4R departures, Runway 9 departures, 22L and 22R departures, and 22L and 27 arrivals). As a result, communities affected by the north/south runway configurations bear a disproportionate share of jet overflights. Conversely, 11 percent of Logan's 1998 jet operations were on runways affecting communities west of the airport (Runway 27 and 33L departures, and 15R arrivals) and 13 percent utilized over-the-water runways (15R for departures and 33L for arrivals).



RUNWAY LENGTH DATA (feet)

Runway	Landing Length	Takeoff Length	Displaced Threshold
15R	9,201	10,081	880
33L	10,081	10,081	—
4R	8,850	10,005	1,155
22L	8,806	10,005	1,199
4L	7,860	7,860	—
22R	7,045	7,860	815
9	7,000	7,000	—
27	7,000	7,000	—
15L	2,557	2,557	—
33R	2,557	2,557	—

1998 JET RUNWAY USE

Runway	Departure	Arrival
4L	0%	2%
4R	8%	41%
9	35%	0%
15R	6%	2%
22L	5%	7%
22R	28%	0%
27	14%	28%
33L	5%	19%

Logan Airport Layout Plan

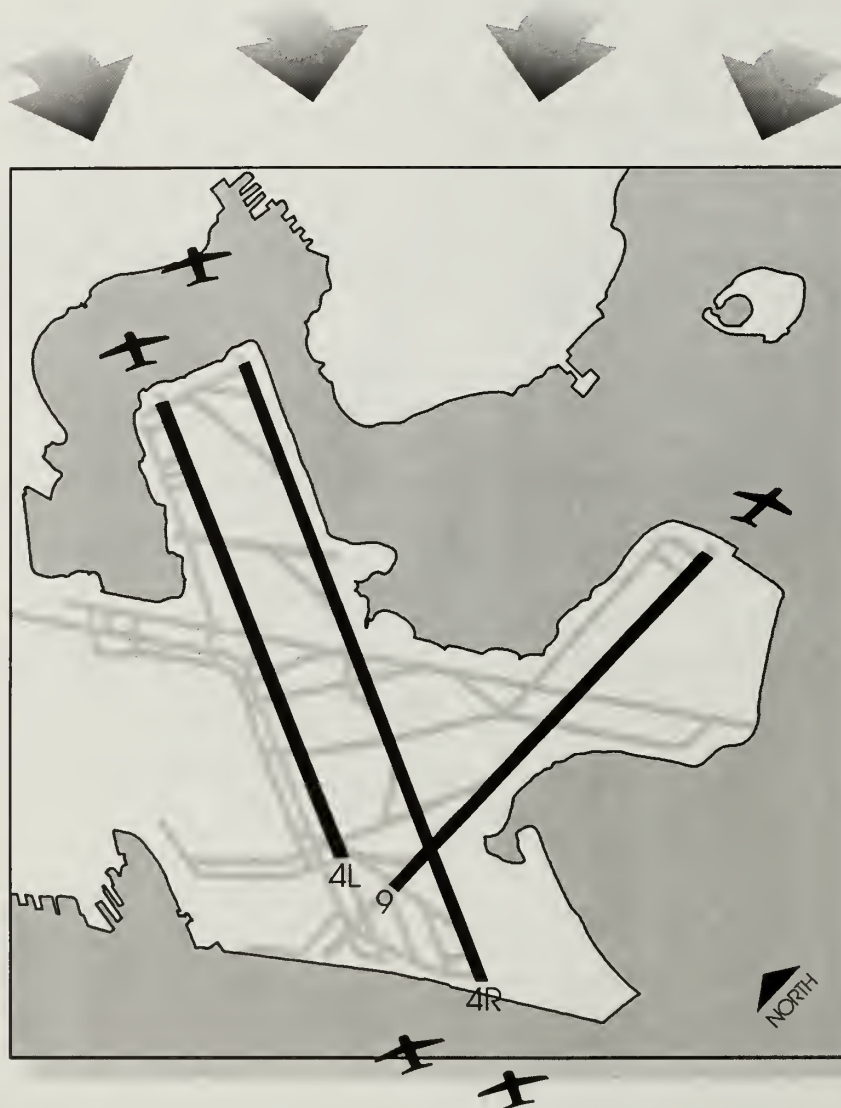
Source: 1998 Annual Update



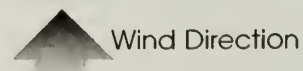
Figure 1.2-1

Existing Logan Airfield Runway Layout

Three-Runway Configuration



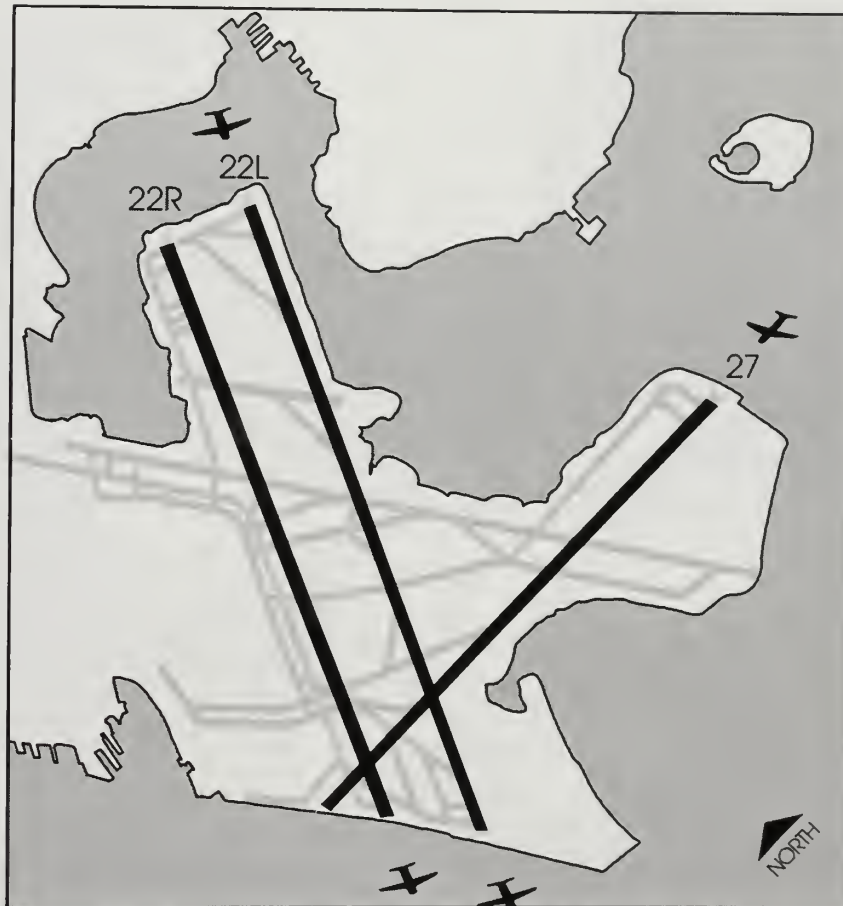
LEGEND



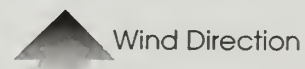
Northeast Wind Configuration Using Runway 4L, Runway 4R and Runway 9

Figure 1.2-2

Three-Runway Configuration



LEGEND



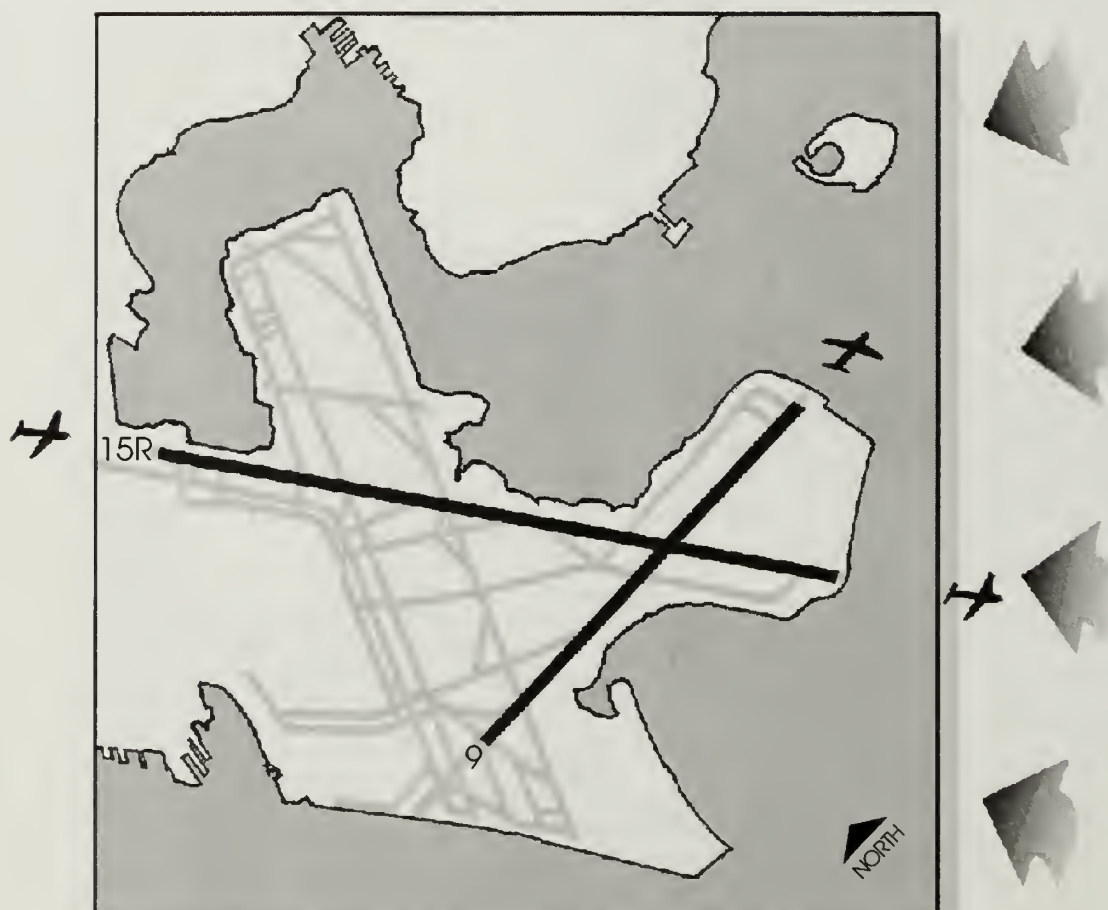
Wind Direction



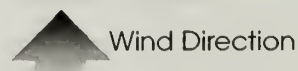
Southwest Wind Configuration Using Runway 22L, Runway 22R and Runway 27

Figure 1.2-3

Two-Runway Configuration



LEGEND



Wind Direction

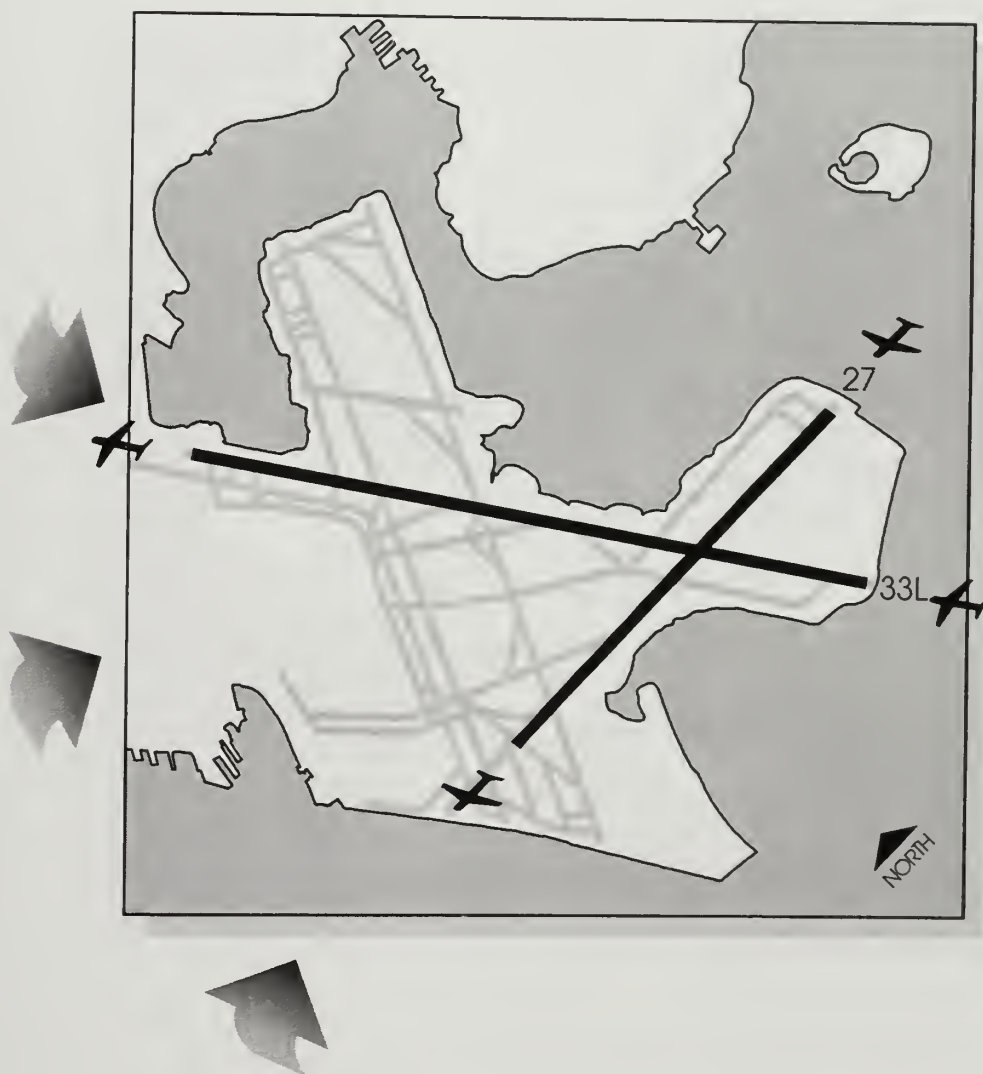
NOTE

Runway 15L only used for arrivals by small planes, such as the 9-passenger Cessna used by Cape Air.



Figure 1.2-4
East/Southeast Wind Configuration Using Runway 15R, Runway 15L and Runway 9

Two-Runway Configuration



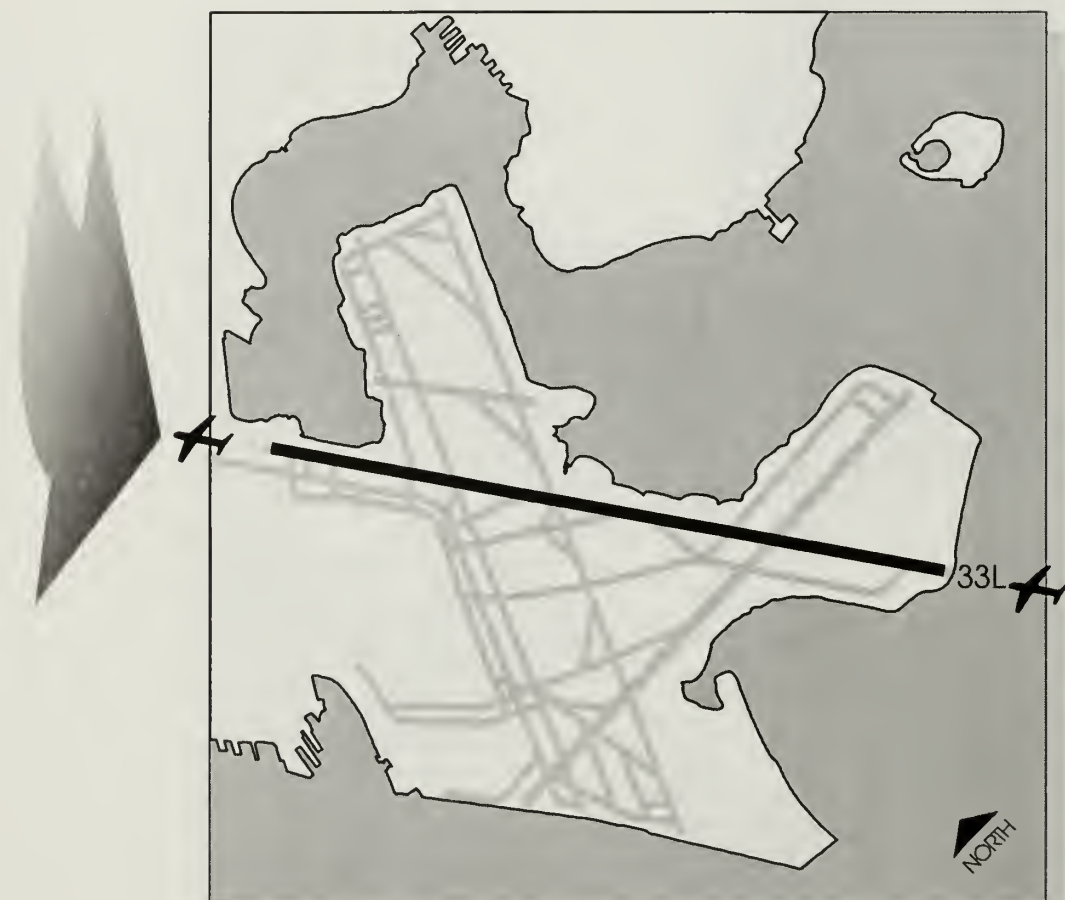
LEGEND



Moderate Northwest Wind Configuration Using Runway 27 and Runway 33L

Figure 1.2-5

One-Runway Configuration



LEGEND

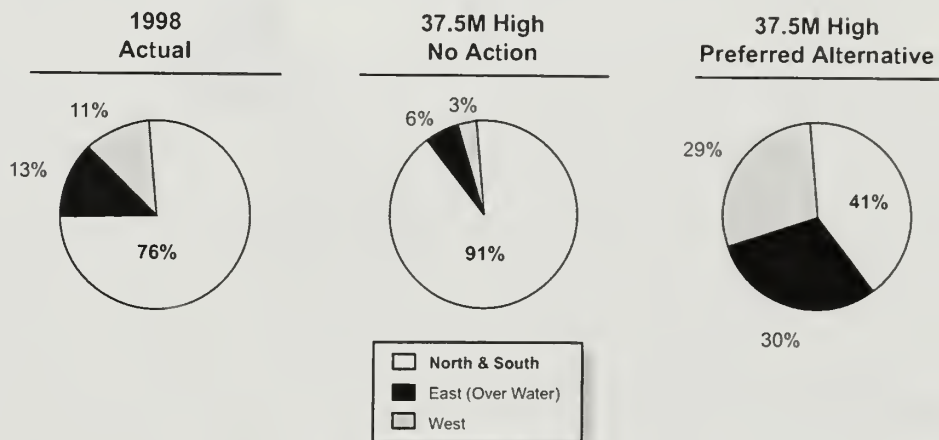


Figure 1.2-6

Strong Northwest Wind Configuration Using Runway 33L

Figure 1.2-7 shows that if no action is taken to correct this limitation in the airfield layout, Logan's dependence on north-south runways will increase to more than 90 percent under the 37.5M High Fleet¹⁰ scenario. With construction of proposed Runway 14/32, Logan's dependence on north-south configurations would decline to 41 percent. By making a third runway available in the east-west operating direction, the Preferred Alternative allows for a more balanced geographic distribution of jet overflights – 41 percent north/south, 30 percent east (over water), and 29 percent west.

Figure 1.2-7
Geographic Distribution of Jet Flights at Logan



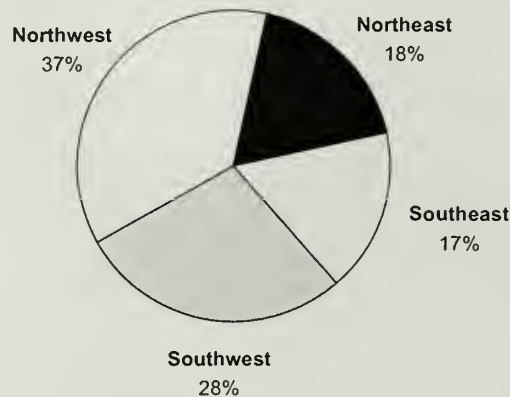
1.2.2.1 Impact of Wind and Weather Conditions on Airport Capacity

When weather conditions deteriorate, wind direction shifts to the northwest, or winds intensify, Logan is reduced to operating with only one or two active runways. A major limitation of Logan's airfield is the lack of a three-runway configuration in the northwest/southeast orientation. Even under clear weather conditions, northwest winds can create a situation in which a three-runway configuration is unavailable. Air traffic control procedures and other restrictions may further reduce the capacity of the one- or two-runway operating configurations. As a result, even when aircraft demand levels are moderate, delays can reach severe levels if wind or weather dictates the use of low capacity configurations.

¹⁰ The High Fleet assumes a greater proportion of non-jet aircraft and thus a higher level of total operations for the same passenger level than the Low Fleet, which assumes more large jet operations than non-jet operations, similar to current conditions.

Figure 1.2-8 illustrates the percentage of time that winds from different directions occur at Logan during a typical year. In light winds and good visibility, high capacity three-runway configurations are generally available. With moderate northeast and southwest winds, Logan can also operate on high capacity runway configurations. With northeast winds, the Runways 4L, 4R and 9 configuration is available for use (see Figure 1.2-2). When wind direction shifts to the southwest, the Runways 22L, 22R and 27 configuration is used (see Figure 1.2-3).

Figure 1.2-8
Typical Yearly Wind Direction at Logan



Wind-related delays become significant when moderate to strong winds originate from the northwest, the most common wind direction at Logan. Because northwest winds usually coincide with clear, visual flight rules (VFR) weather conditions, operations could be accommodated with minimal delay if a three-runway configuration were available. In fact, Logan experiences VFR weather conditions 96 percent of the time when winds blow from the northwest. Under moderate northwest winds, Logan is forced to use the low-capacity Runway 27 and 33L configuration (see Figure 1.2-5). Two-runway configurations have an operational capacity of up to 90 operations per hour in VFR conditions.

When northwest winds are especially strong or gusty, Runway 27 cannot be used due to excessive crosswinds. Under these conditions, Runway 33L is the only runway available for both landings and takeoffs (see Figure 1.2-6). Logan's operational throughput is reduced to 60 or fewer operations per hour; aircraft delays become severe and increase exponentially.¹¹



¹¹ This condition occurs approximately 10 days per year. See the *Northwest/Southeast Winds Case Study*, Logan Airside Improvements Planning Project Draft EIS/EIR, Appendix I.

1.2.2.2 Impact of Aircraft Mix on Airport Capacity

Logan operates most efficiently when air traffic controllers are able to segregate aircraft of different weight classes into separate arrival streams, allowing shorter separation distances between aircraft. Thus, the highest operating capacities at the airport are achieved when a three-runway configuration is available for use. For example, when the Runways 4L, 4R and 9 configuration is available, Runway 4L is primarily used for non-jet arrivals, Runway 4R is primarily used for jet arrivals and Runway 9 is dedicated to departures.¹² However, when poor weather and/or wind conditions restrict runway availability, controllers are forced to place all aircraft in a single arrival stream, diminishing the airport's capacity. While aircraft are currently limited to a single arrival runway during northwest wind conditions, this would be corrected by construction of the proposed new runway.

When wind and weather conditions force Logan to use a single arrival stream, the mix of aircraft seeking to use the airfield influences the capacity of the airport's runways. For safety reasons, the FAA sets minimum separation standards, which must be maintained between aircraft. All aircraft generate aerodynamic turbulence, known as wake vortices, which trail behind the aircraft in flight. Larger aircraft produce much stronger vortices, which can upset smaller trailing aircraft. Therefore, if smaller aircraft must operate behind larger jets on the same runway, increased separations between aircraft must be maintained. Longer separations reduce the capacity of each runway, since fewer planes can land in a given hour. Because of its role as a regional hub for New England communities and its lack of a dominant jet carrier, Logan exhibits a high proportion of small aircraft operations.

1.2.2.3 Revised Wake-Vortex Turbulence Rules

In response to recommendations by the National Transportation Safety Board, the FAA implemented several revisions to the wake turbulence separations that became effective in 1996.¹³ They are discussed in detail in Section 1.2.3.2 of the Airside Project Draft EIS/EIR. These revisions have increased the average separation between arriving aircraft at Logan, and as a result, have decreased capacities and increased delay, particularly during use of two-runway configurations. These changes make it more important for air traffic controllers to be able to segregate aircraft arrival streams at Logan.



¹² Runways 4L and 4R also handle some departures.

¹³ "Safety Issues Related to Wake Vortex Encounters During Visual Approach to Landing," *NTSB Report/SIR-94/01*, February 1994.

1.3 Passenger Volumes and Aircraft Operations

1.3.1 Current Activity and Historic Trends

Logan accommodated 27.4 million air passengers and 479,000 aircraft operations in 2000. More than 60 airlines, including national and international passenger airlines, commuter airlines, and all-cargo airlines, provide direct flights from Logan Airport to over 100 destinations worldwide. In addition to commercial airline services, Logan also handles general aviation activity. In 1999, Logan was the 18th busiest airport in the US in terms of passenger traffic; 12th in aircraft operations; and 19th in cargo tons.¹⁴ Logan functions primarily as an "origin/destination"¹⁵ airport, with 88 percent of passengers originating or terminating at Logan, and only 12 percent of passengers connecting from one flight to another. However, Logan also serves as a regional hub, providing small and isolated New England communities with access to the national airport system. While regional carrier flights carry only a small percentage of total passengers, approximately half of their passengers rely on connections at Logan to reach their ultimate destinations.

Table 1.3-1 provides a summary of air passengers, flight operations, and freight volume from 1980 to 2000. Passenger volume at Logan has increased over time consistent with the increasing levels of air passenger traffic experienced nationwide. However, the rate of passenger growth at Logan has slowed in recent years. Since 1980, passenger traffic at Logan has increased at an average annual rate of 3.1 percent. For the most recent five years (1995 to 2000) Logan passengers grew more slowly, increasing by 2.4 percent annually. In 2000, Logan's passenger traffic increased by just 1.3 percent over the prior year. The observed slow-down in Logan's passenger growth is attributable to the increased role of regional airports and rail as attractive transportation options to Logan Airport.

Aircraft operations at Logan have historically grown at a slower rate than passenger volume due to increases in aircraft size and/or passenger load factors. Between 1980 and 2000, aircraft operations increased at an average annual rate of 2.4 percent. Since 1995 the rate of aircraft operations growth has slowed to 0.6 percent per year. In 1999 and 2000, aircraft operations declined by 2.5 and 3.2 percent, respectively, as regional airlines reduced scheduled services at Logan.

More than 1 billion pounds of freight (cargo and mail) passed through Logan Airport in 2000. Approximately half of Logan's air freight is carried in the belly compartments of passenger aircraft and the remaining half is transported by all-cargo airlines, such as Federal Express and United Parcel Service. In 2000, all-cargo airlines performed approximately 12,000 aircraft operations at Logan, or 2.6 percent of Logan's total operations. Since all-cargo operations primarily occur during off-peak nighttime hours (10:00 PM and 6:00 AM), they do not contribute to aircraft delays at Logan.



¹⁴ Airports Council International, Worldwide Airport Traffic Report, 1998.

¹⁵ For an "origin/destination" airport, most passengers either originate or terminate their airline journey at that airport. For a connecting airport, a large percentage of passengers stop at the airport as part of their airline journey to transfer from one flight to another.

This Supplemental Draft EIS/FEIR includes updated operational and environmental analyses of 1998 conditions consistent with those described in the *Logan Airport 1998 Annual Update*.¹⁶ While the *Logan Airport 1999 Environmental Status and Planning Report (ESPR)*¹⁷ published in December 2000 includes updated analyses for 1999, the differences between the two study years are small. Between 1998 and 1999, operations declined by 2.5 percent, primarily due to a decline in regional carrier operations.¹⁸ Fleet mix and runway use varied little, and the shape of the noise contours and population impacts were also similar, with slightly less impact in Winthrop and Boston and slightly more impact in Chelsea and Revere in 1999 compared to 1998.¹⁹ The air quality and other environmental analyses also yielded similar results.²⁰ Since the relevant comparison for evaluating the proposed Airside Project improvements is the comparison between the No Action and Preferred Alternatives, and since 1998 and 1999 are similar in terms of passengers, operations, and environmental impacts, this Supplemental DEIS/FEIR includes the 1998 modeling analysis as representative of recent conditions at Logan.

▼
16 *Logan Airport 1998 Annual Update*, October 15, 1999.

17 *Logan Airport 1999 Environmental Status and Planning Report*, December 15, 2000.

18 A more detailed comparison of the change between 1998 and 1999 passengers and operations is included in Chapter 2 of the ESPR.

19 A more detailed comparison of the change between 1998 and 1999 noise impacts is included in Chapter 6 of the ESPR.

20 The ESPR compares all of the 1998 and 1999 analyses and discusses the differences in detail.

Table 1.3-1
Air Passengers, Aircraft Operations, and Freight: 1980 to 2000

Year	Air Passengers (000)	Annual Percent Change	Flight Operations (000)	Annual Percent Change	Total Cargo and Mail* (000 lbs.)	Annual Percent Change
1980	14,850	-	296	-	505,245	-
1981	14,941	0.6%	284	-4.1%	497,632	-1.5%
1982	15,959	6.8%	275	-3.2%	503,151	1.1%
1983	17,905	12.2%	316	14.9%	597,483	18.7%
1984	19,488	8.8%	351	11.1%	677,803	13.4%
1985	20,506	5.2%	380	8.3%	666,994	-1.6%
1986	21,933	7.0%	396	4.2%	664,559	-0.4%
1987	23,369	6.5%	415	4.8%	706,046	6.2%
1988	23,732	1.6%	408	-1.7%	784,730	11.1%
1989	22,274	-6.1%	389	-4.7%	752,554	-4.1%
1990	22,878	2.7%	425	9.3%	753,253	0.1%
1991	21,450	-6.2%	430	1.2%	766,584	1.8%
1992	22,723	5.9%	474	10.2%	819,522	6.9%
1993	23,579	3.8%	493	4.0%	835,746	2.0%
1994	24,468	3.8%	459	-6.9%	923,557	10.5%
1995	24,192	-1.1%	466	1.5%	869,642	-5.8%
1996	25,134	3.9%	456	-2.1%	911,166	4.8%
1997	25,568	1.7%	483	5.8%	974,170	6.9%
1998	26,527	3.8%	507	5.2%	970,764	-0.3%
1999	27,052	2.0%	495	-2.5%	987,655	1.7%
2000	27,413	1.3%	479	-3.2%	1,047,250	6.0%

Sources: *Boston-Logan International Airport, 1994/1995 Generic Environmental Impact Report; Logan Airport Annual Updates - 1996, 1997 and 1998; Logan Airport, 1999 Environmental Status and Planning Report.*

Boston-Logan International Airport, Monthly Airport Traffic Summary, December 2000.

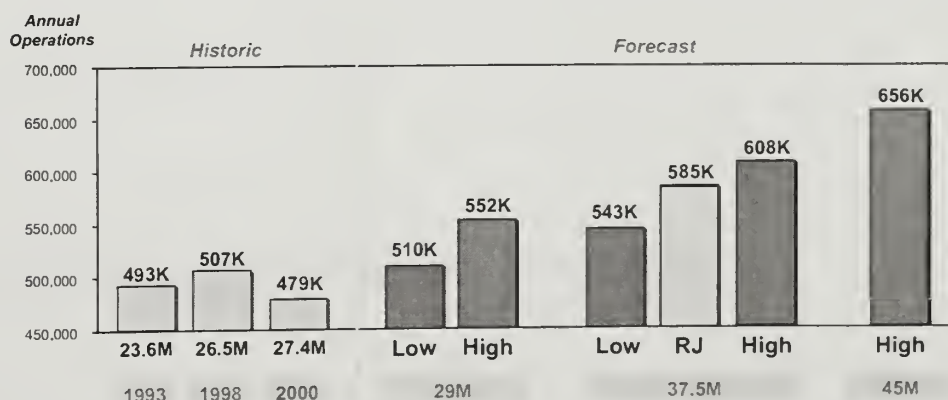
* Includes cargo and mail carried in all-cargo aircraft and in the belly compartments of passenger aircraft.

1.3.2 Forecast Aircraft Operations and Passenger Levels

Airline passenger traffic, both locally and nationally, has increased dramatically over time and is forecast to continue to grow into the future. The airfield operational and environmental impact analyses presented in the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR are based on forecasts of future aircraft operations and passenger demand for Logan Airport. Multiple aircraft fleets were analyzed for each future passenger demand level. An aircraft fleet consists of a mix of different aircraft types (i.e., large jets, regional jets and non-jets). A fleet with a high proportion of large jets, which carry more passengers than regional jets or non-jets, requires comparatively fewer annual aircraft operations for a given number of passengers than a fleet with a lower proportion of large jets.

Massport has adopted a range of near-term and long-term activity forecasts for planning purposes (see Figure 1.3-1). Annual passenger demand for Logan Airport is forecast to reach 29 million passengers (29M) early in this decade. Logan's most recent annual passenger level is 27.4 million for 2000, or 96 percent of the 29 M near-term passenger forecast.²¹ If Logan remains on its current growth path, which due to the effectiveness of regional planning efforts is slower than its historic long-term growth trend, the Airport is expected to reach 29 million passengers in 2003, 34 million passengers by 2010, and 37.5 million passengers (37.5M) in 2015. These projections are more conservative than the forecasts presented in the Airside Project Draft EIS/EIR, which assumed that Logan would reach these activity levels earlier, i.e., 29M in 1999 and 37.5M in 2010. Nevertheless, the analyses presented in the Airside Project Draft EIS/EIR remain valid because they present the operational and environmental impacts associated with a range of future near-term and long-term operating levels. The revised forecast dates are consistent with the FAA's most recent Terminal Area Forecasts for Logan Airport. In its 1999 Terminal Area Forecasts, the FAA projects that Logan Airport will reach 33.6 million passengers in 2010 and 37.1 million passengers in 2015.

Figure 1.3-1
Logan Airside Passenger and Fleet Forecasts – Annual Operations by Fleet



²¹ Massport's planning forecasts were reviewed in the *Logan Airport 1999 Environmental Status and Planning Report*, December 15, 2000.

Massport's projected operations for the near-term (i.e., 29 million passengers) are 510,000 for a Low Fleet scenario and 552,000 for a High Fleet scenario. For the long-term (i.e., 37.5M passengers), annual aircraft operations are forecast to range from 543,000 to 608,000. The forecast range for aircraft operations reflects different assumptions regarding the aircraft fleet mix at Logan. The Low Fleet scenarios assume only two major regional airlines and a higher proportion of large jet aircraft operations than assumed in the High Fleet scenarios. The High Fleet scenarios assume a fleet mix similar to 1993 conditions, when three major regional carriers operating non-jet aircraft accounted for nearly 50 percent of total airport operations and airline overscheduling occurred during peak periods. For this Supplemental DEIS/FEIR, an alternative future fleet, which is characterized by a high proportion of the new technology regional jets, was evaluated for the 37.5M passenger level.

The analysis in this Supplemental DEIS/FEIR focuses on a comparison between the Preferred Alternative (Alternative 1A) and the No Action Alternative (Alternative 4) for the 29M Low Fleet and the 37.5M High Fleet scenarios, which were previously analyzed in the Airside Project Draft EIS/EIR. The operational and environmental analyses for Alternatives 1, 2 and 3 for the 29M Low Fleet and 37.5M High Fleet are summarized in Appendices E and F. All alternatives for the new 37.5M High RJ fleet are analyzed in this Supplemental DEIS/FEIR. For ease of reference, the analysis assumptions used in this Supplemental DEIS/FEIR are summarized in Table 1.3-2. The alternative fleet scenarios are more fully described in Chapter 4 of this report.

Table 1.3-2
Passenger and Aircraft Operations Analysis Assumptions

Time Frame	Annual Passengers	Annual Aircraft Operations	Fleet Assumptions	SDEIS/FEIR Alternatives	SDEIS/FEIR Airside Scenarios
Near Term	29 million	510,000	<u>Low Fleet</u> ■ 2 major regional carriers ■ No airline overscheduling	1A and 4 ¹	29M Low Fleet
Long Term	37.5 million	608,000	<u>High Fleet</u> ■ 3 major regional carriers ■ Airline over scheduling during peak periods	1A and 4 ¹	37.5M High Fleet
Long Term	37.5 million	585,000	<u>High RJ Fleet</u> ■ 3 major regional carriers ■ Regional jet aircraft 31% of the fleet ■ Airline overscheduling during peak periods	1, 1A, 2, 3 and 4	37.5M High RJ Fleet

¹ Analysis results for Alternatives 1, 2 and 3 are contained in Appendices C, E and F. Analysis results for other fleet scenarios are contained in the Airside Project Draft EIS/EIR.

1.3.3 Logan's Demand Profile

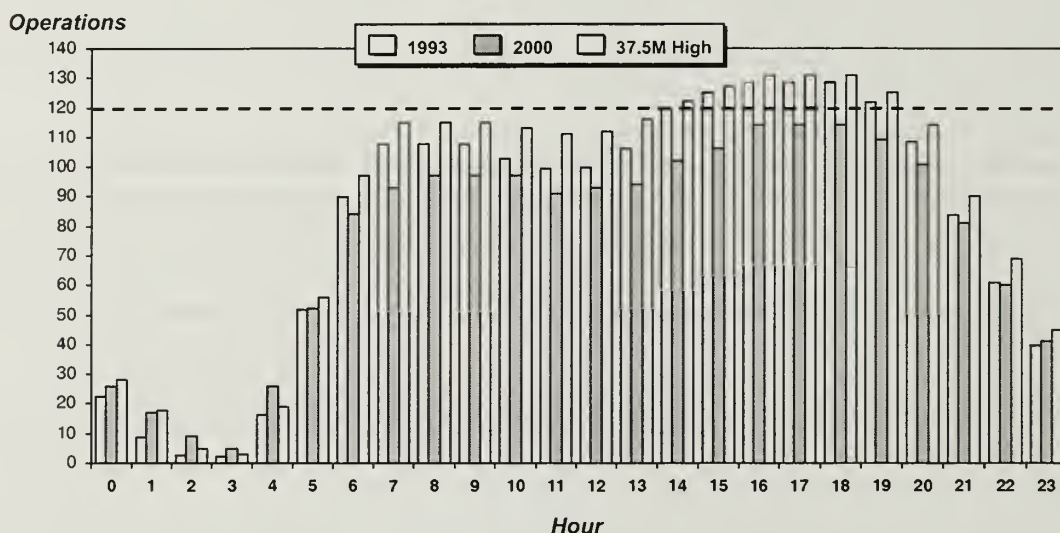
While the volume of annual operations is critical for evaluating Logan's operational and environmental impacts, the distribution of that volume is also important. Flight demand varies by hour, by day of week, and by season, and this variation can have a significant impact on airport delays. This pattern of hourly flight activity is referred to as the airport demand profile.

Logan's capacity during visual flight rules (VFR) conditions is approximately 120 operations per hour, and these VFR conditions prevail approximately 80 percent of the year. Under these good weather conditions, delays accumulate only when demand exceeds the VFR capacity of the airport for a sustained period of time. If demand at an airport causes delays even in good weather, an overscheduling situation exists.

Delays due to airline overscheduling become significant when flight activity levels exceed airfield capacity for a sustained period of time. When a short period of excessive demand is followed by a period of low activity, the airfield has an opportunity to recover and only moderate delays are incurred. If, however, flight activity levels reach or exceed available capacity for a number of consecutive hours, delays build rapidly as flights delayed during one hour add to schedule demand during the next hour. For this reason, three-hour averages of forecast flight activity levels were used to determine the periods when sustained airline overscheduling conditions exist. It is during these periods that a peak surcharge might be applied.

Figure 1.3-2 compares the August weekday demand profiles for 1993 and 2000 with the forecast demand profile for the 37.5M High Fleet. In 1993, a record year for delays at Logan, demand was considerably more peaked than it is today and exceeded the airport's average VFR capacity of 120 hourly operations and the average all-weather capacity of 115 for six consecutive afternoon hours. In contrast, the August 2000 weekday profile never exceeds the average all-weather capacity. The profile comparison clearly demonstrates that while overscheduling was a problem in 1993, it is not a problem today. The 37.5M High fleet assumes three major regional carriers and a high percentage of non-jet activity. Under this forecast scenario, flight demand exceeds Logan's average VFR capacity for six consecutive hours and the average all-weather capacity for most of the day. Clearly, airline overscheduling can be expected to cause serious delays under these conditions.

Figure 1.3-2
Logan's Average Maximum Three Hour Demand Profile –
1993 vs. 2000 vs. 37.5M High (3 Hour Maximum Average)



1.4 Delays at Logan

Delay simulation modeling conducted for the Airside Project Draft EIS/EIR indicates that Logan experienced approximately 120,000 hours of runway delays in 1998. This is six times the FAA's threshold of 20,000 annual delay hours for identifying severely congested airports, which emphasizes the magnitude of Logan's delay problem.

All available measures of delay confirm the severity of aircraft delays at Logan. For 2000, the FAA reports that Logan ranked 6th among the nation's largest airports in delayed operations and 2nd in arrival delays, yet it was only the 12th busiest US airport in terms of aircraft operations.

This section presents historical delay statistics for Logan and comparative delay measures for Logan and other major US airports. The section also provides a description of existing delay measures, identifies the inherent drawbacks of these statistics, and discusses the appropriateness of simulation modeling for estimating delays. The various delay databases maintained by the FAA and US DOT, and the methodologies employed by each to quantify delays are described in Appendix C of this Supplemental DEIS/FEIR.

1.4.1 Delays at Logan and Other US Airports

This section presents delay statistics and rankings for Logan from a variety of sources, including the FAA, the US DOT and simulation modeling performed by both the FAA and the Airside Project study team. While varying methodologies produce different rankings and estimates of delay, these sources are consistent in demonstrating a serious delay problem at Logan. Table 1.4-1 presents Logan's rank since 1990 among US airports by total delayed operations from the FAA Air Traffic Operations Network (OPSNET).²² Based on this delay measure, the FAA has consistently designated Logan as a "seriously congested airport." The table also shows that Logan's rank by arrival delays has progressively worsened over the past decade. For the most recent year, Logan ranked second nationwide—its worst ranking since at least 1990.

Table 1.4-1
Logan's Airside Delay Rank Among US Airports

Year	Rank by Total Delays	Rank by Arrival Delays
1990	9	9
1991	6	7
1992	6	6
1993	5	6
1994	6	4
1995	9	4
1996	9	4
1997	9	3
1998	6	3
1999	7	5
2000	6	2

Source: FAA Air Traffic Operations Network (OPSNET)

Table 1.4-2 compares operations and delays at ten of the busiest airports in the United States based on the FAA OPSNET data. In 2000, New York LaGuardia had the nation's worst delay problem according to OPSNET, followed by Newark and Chicago O'Hare. While Logan ranked 5th in delays per 1,000 operations (and 6th in total delays), it experienced a significantly higher rate of delay than Atlanta, Dallas/Ft. Worth, and Los Angeles even though these airports accommodated 54 to 80 percent more operations than Logan.

²² OPSNET is the official FAA delay reporting system for air traffic management purposes and was formerly known as the Air Traffic Operations Management System (ATOMS). Additional information is provided in Appendix C of this Supplemental DEIS/FEIR. OPSNET counts only the number of flights that suffer a delay of more than fifteen minutes at a single element of the air traffic control (ATC) system (a sector or airport).

Table 1.4-2
FAA OPSNET: 2000 Delay Ranking for Ten of the Busiest US Airports

Airport	Operations	Delayed Flights	Delayed Flights per 1,000	Delayed Arrivals	Delayed Arrivals per 1,000
Atlanta	913,449	28,229	30.9	11,022	24.1
Boston Logan	508,283	24,120	47.5	6,863	27.0
Chicago O'Hare	908,977	57,545	63.3	4,801	10.6
Dallas/Ft. Worth	865,777	20,638	23.8	1,180	2.7
Los Angeles	783,684	17,141	21.9	1,142	2.9
New York Kennedy	358,951	13,930	38.8	648	3.6
New York LaGuardia	392,047	61,120	155.9	3,856	19.7
Newark	457,182	37,132	81.2	3,836	16.8
San Francisco	430,612	24,478	56.8	6,541	30.4
St. Louis	484,224	8,837	18.2	1,178	4.9
	Comparative Operations Index*	Rank	Rank	Rank	Rank
Atlanta	180	4	7	1	3
Boston Logan	100	6	5	2	2
Chicago O'Hare	179	2	3	4	6
Dallas/Ft. Worth	170	7	8	7	10
Los Angeles	154	8	9	9	9
New York Kennedy	71	9	6	10	8
New York LaGuardia	77	1	1	5	4
Newark	90	3	2	6	5
San Francisco	85	5	4	3	1
St. Louis	95	10	10	8	7

Note: Boston ranks 5th in operations among the airports listed, but 12th nationally. Other delay rankings for Logan are also national delay rankings.

* Operations Index-- Boston = 100

Source: FAA Air Traffic Operations Network (OPSNET)

Table 1.4-3 compares 2000 delay estimates from the US DOT's Air Traffic Consumer Reports (ATCR)²³ for the same ten busy US airports. This table shows the percentage of arrivals or departures that were delayed by more than 15 minutes at each airport. While arrivals are delayed more frequently than departures at most airports, Logan has the fourth highest percentage of arrival delays based on the ATCR data. This is similar to the OPSNET data that showed Logan with the 2nd highest rate of arrival delays. The two rankings differ because of different methodologies for counting delays. For example, ATCR estimates that 35 out of 100 arrivals were delayed at Logan in 2000, but OPSNET counts 3 arrival delays per 100 flights. While the methodologies for counting delays differ, both databases indicate that Logan experiences a higher rate of arrival delays than nearly all other large US airports.

Table 1.4-3
US DOT Air Travel Consumer Report: Percentage of Flights Delayed by
15 Minutes or More at Ten Busy US Airports in 2000

Airport	Departure Flight Delays	Arrival Flight Delays
Atlanta	23.4%	25.1%
Boston Logan	25.3%	34.5%
Dallas/Ft. Worth	21.9%	22.0%
Newark	23.6%	30.8%
New York Kennedy	20.7%	28.1%
Los Angeles	27.8%	33.5%
New York LaGuardia	28.9%	42.9%
Chicago O'Hare	33.2%	36.8%
San Francisco	30.0%	39.2%
St. Louis	22.9%	22.4%

Source: US DOT, Air Travel Consumer Report.

Table 1.4-4 ranks the 29 Large Hub²⁴ US airports by average minutes of delay by phase of flight based on the FAA's Consolidated Operations and Delay Analysis System (CODAS)²⁵ data for 12 months ending November 2000. Boston is ranked 5th worst by airborne delays, 3rd by arrival delays, 7th in taxi-in delays and 10th by taxi-out and gate delays. The CODAS data captured 81 percent Logan's actual 2000 operations. The arrival delay ranking is comparable with the OPSNET and ATCR databases.

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23 The US DOT's Air Traffic Consumer Reports (ATCR) provide information about the on-time performance of airline flights. They are based on Airline Service Quality Performance (ASQP) data filed by major carriers. See Appendix C for a full discussion of public delay databases.

24 Large Hub airports are those airports enplaning one percent or more of total passengers. There are 29 Large Hub airports in the US.

25 CODAS was created by the FAA, Office of Policy and Planning to provide more consistent estimates of aircraft delay by combining data from several existing sources, including data from the FAA, US DOT, the Official Airline Guide (OAG), the air carriers' Computerized Reservation System (CRS) and the Air Transport Association (ATA). See Appendix C for a full discussion of public delay databases.

Table 1.4-4

**FAA CODAS: Average Delay by Phase of Flight at the 29 Large Hub Airports
(Minutes) – 12 Months Ending November 2000**

Rank	Taxi-out		Airborne		Taxi-In		Arrival		Gate	
1	LGA	15.27	PHL	6.67	DFW	3.57	LGA	24.26	LGA	13.72
2	EWB	11.94	EWB	6.02	DTW	3.30	SFO	21.52	JFK	13.59
3	PHL	9.57	ATL	5.85	LAX	3.03	BOS	19.33	DEN	13.51
4	JFK	7.91	LGA	5.57	LGA	2.66	EWB	18.92	EWB	12.96
5	ATL	7.67	BOS	5.33	ORD	2.63	ORD	18.78	SFO	12.76
6	ORD	7.59	JFK	4.38	PHL	2.37	HNL	17.12	ORD	12.30
7	DTW	7.17	CLT	4.31	BOS	2.28	PHL	17.05	PHX	12.28
8	MSP	7.10	SEA	4.29	ATL	2.22	JFK	16.72	ATL	11.65
9	DFW	6.99	SLC	4.10	EWB	2.06	LAX	15.90	PHL	11.46
10	BOS	6.86	ORD	4.07	JFK	2.01	DEN	14.53	BOS	10.86
11	STL	6.26	MSP	3.98	DEN	1.90	ATL	14.25	CVG	10.19
12	CVG	5.61	SFO	3.95	STL	1.76	LAS	14.24	STL	9.93
13	SFO	5.59	PIT	3.51	LAS	1.72	PHX	14.23	DFW	9.85
14	IAH	5.53	STL	3.45	MIA	1.71	MIA	13.86	MSP	9.85
15	DCA	5.38	DTW	3.39	PHX	1.70	SEA	13.82	MIA	9.67
16	PHX	5.21	DCA	3.36	MSP	1.49	MCO	13.71	LAS	9.50
17	LAX	5.12	IAH	3.29	SFO	1.48	SAN	13.22	BWI	9.17
18	MIA	5.06	LAX	3.24	IAH	1.42	BWI	13.15	HNL	9.10
19	CLT	5.04	DEN	3.20	CLT	1.35	CVG	12.72	DTW	9.10
20	PIT	4.52	MIA	3.13	HNL	1.31	STL	12.37	MCO	8.91
21	LAS	4.46	CVG	3.10	SEA	1.20	TPA	12.28	SEA	8.80
22	SLC	4.24	PHX	3.00	SLC	1.09	IAH	11.40	IAH	8.76
23	DEN	4.13	DFW	2.87	PIT	1.03	DFW	11.33	SAN	8.69
24	MCO	3.36	MCO	2.37	BWI	1.01	DTW	11.22	LAX	8.37
25	SEA	3.05	BWI	2.21	DCA	0.98	DCA	11.03	PIT	8.01
26	BWI	2.84	TPA	2.01	MCO	0.94	PIT	10.97	SLC	7.77
27	HNL	2.81	LAS	1.44	TPA	0.73	SLC	10.84	TPA	7.77
28	SAN	2.75	SAN	1.39	SAN	0.70	MSP	10.75	CLT	7.53
29	TPA	2.44	HNL	1.20	CVG	0.66	CLT	10.15	DCA	7.41

Sources: Consolidated Operations and Delays Analysis System (CODAS); FAA Office of Aviation Policy and Plans (APO)

1.4.1.1 Comparison of Simulated Delays and Measured Delays

Many reviewers of the Airside Project Draft EIS/EIR have inappropriately compared the Airside modeled delays with the FAA and US DOT delay reporting databases and suggested that Massport's analysis overstates delays at Logan. These measures are not directly comparable. Delay simulation models estimate total annual hours of delay, and are more comprehensive than the FAA and US DOT delay reporting systems, which only report a portion of actual delays incurred. Table 1.4-5 shows the differences between modeled delays and delays reported in the OPSNET and ATCR databases for Logan Airport. As shown, the simulated results for flights delayed over 15 minutes in 1993 and 1998 actually fall between the values reported by the FAA and the US DOT.

The differences between the modeled and reported delays reflect the limitations of the OPSNET and ATCR delay reporting systems, and the fact that FAA and US DOT delay accounting systems serve different purposes than simulation modeling. (These differences are discussed in Section 1.6.2 of the Airside Project Draft EIS/EIR and in Appendix C of the Supplemental DEIS/FEIR.) Recognizing these differences, the FAA uses delay simulation models to assess the benefits of major airport investment projects such as new runways.

Table 1.4-5
Comparison of Airside Modeled Delays and FAA/DOT Reported Delays for Logan Airport

Delay Source	Measure	1993	1998
Airside Analysis	Operating Delays > 15 min	13.6%	14.0%
FAA OPSNET	Operating Delays > 15 min	3.9%	3.2%
US DOT ATCR	Arrival Delays > 15 min	26.6%	28.6%
US DOT ATCR	Departure Delays > 15 min	19.2%	19.2%
Airside Analysis	Average Delay (min)	15.6	14.0
FAA CODAS	Average Delay (min)	NA	6.2

1.4.1.2 Comparison of FAA and Airside Simulated Delays for Logan Airport

In 1992, the FAA Technical Center simulated Logan airfield operations with the Runway Delay Simulation Model (RDSIM) model and estimated that total delay would approach 270,000 hours per year at an activity level of 504,000 annual operations.²⁶ In comparison, simulation modeling for the Logan Airside Improvements Planning Project estimated 120,000 runway delay hours for an annual operations level of 507,000 in 1998. Table 1.4-6 compares the FAA Technical Center modeled delay with the Airside Project's delay estimate. As shown, the Airside Project's results are lower than what the FAA model predicted at a similar level of operations. The FAA has concluded that the Airside Project modeled delays represent "a plausible and conservative estimate when compared with the earlier and simpler Logan Capacity Task Force simulation of the Airport."²⁷

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²⁶ Boston Logan International Airport Capacity Enhancement Plan, FAA, October 1992.
²⁷ FAA New England Region letter to Massport, dated June 14, 1999.

Table 1.4-6
Comparison of Airside Project Modeled Delays for Logan Airport

Source	Year/Scenario	Logan Operations	Estimated Annual Delay Hours
FAA	Future Year	504,000	268,700
Airside Project	1998	507,000	120,000

Source: FAA, Airport Capacity Task Force and Massport, *Logan Airside Improvements Planning Project, Draft EIS/EIR*.

1.4.2 Delays at Other Airports and Changes in Logan's Delay Ranking

During the meetings of the SDEIS Panel, a number of questions were raised about the delay modeling in the Airside Project and the interpretation of the simulation results. The modeling results presented throughout the Draft EIS/EIR and this Supplemental DEIS/FEIR represent only those delays that are attributed to Logan conditions. While these Logan-caused delays are clearly the most appropriate measures for evaluating the airside improvements, the FAA and Massport decided to also assess these delays within the greater context of the total delays at Logan. In addition to delays due to Logan congestion, delays can also accrue due to congestion elsewhere in the national air transportation system. For example, congestion at LaGuardia frequently results in gate holds for passengers departing from Logan; however, since these are not Logan-caused delays, they are not reflected in the modeling results for this project. It is therefore important to understand not only the impacts of the potential airside improvements on the Logan-caused runway and taxiway delays, but also on total delays, including those caused by other airports. This requires a basic understanding of how runway and taxiway delays relate to total Logan delays, how delays at other airports affect Logan, and how congestion at Logan impacts other airports. Within this context, the FAA and Massport assessed how Logan's national delay ranking might change if the proposed airside improvements were implemented.

Section 1.6.2 of the Airside Project Draft EIS/EIR and Appendix C of this Supplemental DEIS/FEIR describe the strengths and limitations of the FAA Consolidated Operations and Delay Analysis System (CODAS), which is generally considered to be the most comprehensive database of delay statistics available. While these delay statistics are not directly comparable to the simulation results, they do contain causal information that can be used to better assess the overall delay picture at Logan. CODAS statistics include delays for all phases of flight (gate, taxi-out, airborne, and taxi-in), but the gate delays are further segregated into Estimated Departure Clearance Time (EDCT) "Where Taken" and "Where Caused" delay. For example, a twenty-minute gate hold at LaGuardia due to northwest wind congestion at Logan would be counted as twenty minutes of "Where Taken" delay for LaGuardia and twenty minutes of "Where Caused" delay at Logan. These statistics are the only benchmarks that capture the impact that a disruption at one airport can have on the ability of another airport to operate on schedule. For that reason,

these measures are the most appropriate for assessing the impact of Logan on other airports and the impacts of those other airports on Logan.

Table 1.4-7 presents CODAS delay statistics for Logan and for the top ten Large Hub destinations served from the airport.²⁸ For the twelve months ending November 2000, Logan was fifth in terms of total delay and third in terms of arrival delay.²⁹ While these statistics emphasize the delay problems faced at the airport and the need for the proposed airside improvements, the EDCT "Where Taken" and "Where Caused" delays further explain the interaction between Logan delays and delays at other airports. Figure 1.4-1 shows the flight frequencies between Logan and its top ten Large Hub destinations.

Table 1.4-7
CODAS Delays for Logan and Its Top Ten Large Hub Destinations

Airport	Pct of Logan Sched Dps	Total Delay		Arrival Delay		"Where Taken" Delay		"Where Caused" Delay	
		Mins/Op	Rank	Mins/Op	Rank	Mins/Op	Rank	Mins/Op	Rank
Boston BOS		7.86	5	19.33	3	0.79	7	2.75	5
New York LGA	5.1%	12.12	1	24.26	1	0.46	26	8.08	1
Philadelphia PHL	5.0%	9.85	3	17.05	7	0.61	13	1.79	7
New York JFK	4.4%	7.60	6	16.72	8	0.66	11	0.54	11
Chicago ORD	4.3%	7.39	7	18.78	5	0.37	28	3.54	4
Washington DCA	3.6%	5.48	17	11.03	25	0.97	3	0.02	21
Atlanta ATL	3.0%	8.25	4	14.25	11	0.63	12	1.44	8
Newark EWR	2.2%	10.38	2	18.92	4	0.57	17	4.45	3
Dallas DFW	2.1%	6.97	9	11.33	23	0.43	27	0.25	15
Orlando MCO	2.1%	3.99	25	13.71	16	1.04	2	0.02	23
Los Angeles LAX	1.6%	6.24	12	15.90	9	0.60	15	1.08	9

Notes:

Percent of Logan departures for top ten Large Hub destination airports based on CY2000 OAG Schedules

Delays from FAA APO CODAS for 12 months ending November 2000.

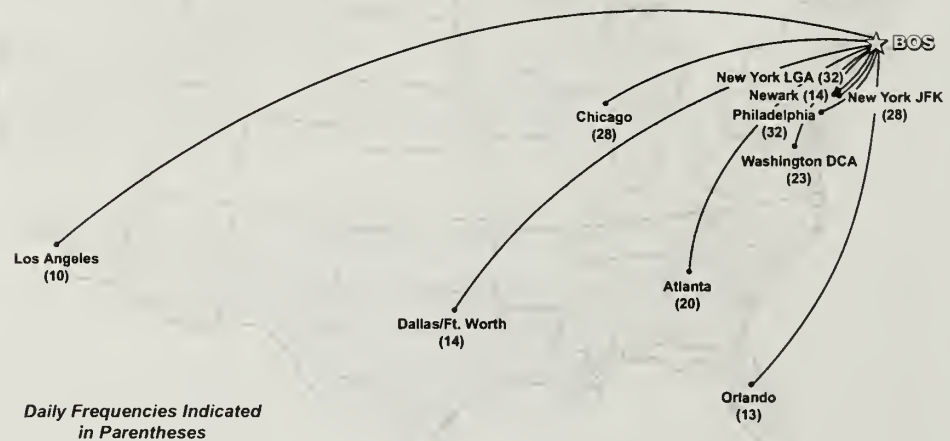
Rank indicates rank among the 29 US Large Hub airports.



²⁸ Large Hub airports are those airports enplaning one percent or more of total passengers. There are 29 Large Hub airports in the US.

²⁹ Note that these rankings are the rankings relative to the 29 Large Hub airports in the US.

Figure 1.4-1
Logan Top 10 Large Hub Destinations



Logan ranks fifth in “Where Caused” delay, indicating that Logan is one of the airports most likely to cause delays at other airports and departure gate holds in particular. Airports ranked above Logan in “Where Caused” delay include LaGuardia, O’Hare, and Newark, three of the most delayed airports in the US. LaGuardia and O’Hare are both known for causing major delays throughout the air traffic network, and both O’Hare and Newark are hub airports with banks of flights that influence airports throughout the country. The fact that Logan ranks close behind them in “Where Caused” delays indicates that Logan congestion is having a major impact throughout the national air transportation system.

Logan also experiences a significant number of delays due to congestion at other airports, as evidenced by its rank of seventh in “Where Taken” delay. In fact, Logan’s top destination, LaGuardia, is not only the most delayed airport in the country in terms of total delays and arrival delays, it is also the airport most likely to cause delays at other airports. Since LaGuardia is Logan’s top destination, Logan experiences a large number of gate hold delays due to LaGuardia congestion. Similarly, major Logan destinations such as Philadelphia, Chicago, Atlanta, and Newark are also among the top ten Large Hub airports in terms of “Where Caused” delay, creating additional Logan delays that have nothing to do with Logan congestion.

While the “Where Caused” delay statistic represents only a sub-set of the total delays experienced at an airport, it removes the influence of other airports, allowing direct comparison of the delays caused by individual airports. This makes it useful for estimating the total Logan delays caused by other airports relative to the Logan-caused

runway and taxiway delays generated by the simulation models and reported throughout this Supplemental DEIS/FEIR.

While Table 1.4-8 presents only the top ten airports in terms of the delay they cause at Logan, the calculations shown were performed for each Logan destination. First, the "Where Caused" delays for each airport were compiled and compared to Logan's "Where Caused" delay value of 2.75 minutes per arrival (see Table 1.4-7). Next, the most recent simulated runway and taxiway delay hours were distributed among the airports served directly from Logan. The 142,000 hours of annual runway and taxiway delay developed for the updated 1998 baseline analysis were assumed to represent current delays and were distributed according to the percentage of Logan departures to each destination airport. For example, LaGuardia represents 5.1 percent of Logan's scheduled departures, it was therefore assumed that 5.1 percent of Logan's 142,000 modeled runway and taxiway delay hours (approximately 7,200 hours) were accumulated by operations serving LaGuardia.

After distributing these Logan-caused runway and taxiway delays, it was then assumed that the impact of any airport on Logan is proportional to the ratio of the "Where Caused" delays of the two airports. Using the LaGuardia example once again, since LaGuardia had nearly three times the "Where Caused" delay as Logan, it was assumed that for each hour of Logan-caused delay estimated by the models, Logan passengers also experienced nearly three times as many hours of delay due to LaGuardia congestion. Accumulating these statistics for each airport served directly from Logan, it is estimated that in addition to the 142,000 hours of Logan-caused delay, passengers at the airport currently experience an additional 55,000 hours of delay caused by congestion at other airports.

Table 1.4-8
Estimated Logan Delays Caused by Other Airports

Airport	Pct of Logan Sched Deps	"Where Caused" Delay per Arrival	Delays at Dest as pct of Logan Delays	Est Annual Delay Caused by Logan	Est Annual Delay Caused by Dest
New York LGA	5.1%	8.08	294.4%	7,191	21,170
Chicago ORD	4.3%	3.54	129.1%	6,096	7,869
Newark EWR	2.2%	4.45	162.2%	3,154	5,114
Philadelphia PHL	5.0%	1.79	65.1%	7,157	4,657
San Francisco SFO	1.5%	5.38	196.0%	2,135	4,184
Atlanta ATL	3.0%	1.44	52.3%	4,328	2,265
London LHR	0.9%	2.75	100.0%	1,325	1,325
New York JFK	4.4%	0.54	19.6%	6,186	1,213
St. Louis STL	0.9%	1.83	66.5%	1,325	881
Los Angeles LAX	1.6%	1.08	39.5%	2,217	875
Top Ten Airports	29.0%	0.96	34.9%	41,112	49,551
Remaining 97 Airports	71.0%	0.10	3.6%	100,888	5,132
Total	100.0%	1.06	38.5%	142,000	54,683

Notes:

When no CODAS delays available, 0.01 for US/Canada/Mexico/Caribbean destinations, 2.75 for European/Pacific destinations

Top ten airports ranked by "Est. Annual Delay Caused by Dest."

CODAS delays for 12 months ending November 2000

The analysis shows that the majority of Logan's delays are due to runway and taxiway congestion at the airport, but that the role of other airports should not be ignored. In fact, the analysis demonstrates that delays at other airports make up nearly thirty percent of the total capacity-related delays experienced by Logan passengers. It is also notable that over ninety percent of these delays caused by other airports are due to only ten airports, most of which have "Where Caused" delays similar to Logan's. This implies not only that delay reductions at these airports would benefit Logan passengers, but also that improvements at Logan would benefit passengers at other airports throughout the country.

Based on the analysis of delays at other airports, it is possible to estimate the potential change in Logan's national delay rankings with implementation of the Preferred Alternative. The simulation analysis of 1998 conditions presented in Section 4.6.1 of this Supplemental DEIS/FEIR shows that implementation of the Preferred Alternative would reduce the Logan-caused runway delays by 38,000 annual hours or 32 percent. While taxiway modeling was not performed for the 1998 analysis, based on the results of the 29M Low Fleet analysis, it was projected that the 22,000 estimated baseline taxiway delay hours would be reduced by approximately 15,000 hours under the Preferred Alternative. Based on this delay reduction and the previous analysis of delays caused by other airports, the proposed airside improvements would have reduced total delays at Logan, including those caused by other airports, by approximately 27 percent.

To convert this change in total delays into an estimate of the change in Logan's delay ranking with the Preferred Alternative, assumptions must be made regarding the change in delays at other airports. As demand levels increase, delays at other airports will tend to rise. However, flight delays are a nationwide problem, and there are numerous initiatives underway to address delays at airports throughout the country. These initiatives will tend to reduce delays, but without specific details, it is difficult to estimate the magnitude of the potential delay reductions that may result. For the purposes of this analysis, it has been assumed that delays at other airports remain constant relative to Logan delays. However, it is important to understand that improvements at other airports will benefit Logan passengers, even if Logan's delay ranking might be negatively impacted as delays at other airports improve.

Logan-caused runway and taxiway delays represent the largest portion of delays experienced at the airport, but Logan is also impacted by delays at other airports, just as those airports are impacted by Logan. This relationship means that improvements at Logan have benefits around the country and that delay reductions at other airports provide benefits to Logan passengers.

Table 1.4-9 shows how Logan's current CODAS delay rankings might have changed with the proposed airside improvements. Logan's national delay ranking would have improved from third to thirteenth in terms of arrival delays and from fifth to fourteenth in terms of total delays if the Preferred Alternative, including Runway 14/32 had been in place. In addition, Logan's arrival delay would be reduced by 5.2 minutes per operation. If other airports made improvements similar to those proposed at Logan (reducing delays by

nearly thirty percent), Logan's delay rankings would be unchanged from the current rankings, but Logan passengers would experience an even greater reduction in delays.

Table 1.4-9
Estimated Change in Logan's CODAS Delay Rankings

Airport	Before Airside Improvements				After Airside Improvements			
	Arrival Delay		Total Delay		Arrival Delay		Total Delay	
	Mins/Op	Rank	Mins/Op	Rank	Mins/Op	Rank	Mins/Op	Rank
New York LGA	24.26	1	12.12	1	24.26	1	12.12	1
San Francisco SFO	21.52	2	5.89	13	21.52	2	5.89	12
Boston BOS	19.33	3	7.86	5	14.13	13	5.74	14
Newark EWR	18.92	4	10.38	2	18.92	3	10.38	2
Chicago ORD	18.78	5	7.39	7	18.78	4	7.39	6
Honolulu HNL	17.12	6	2.78	29	17.12	5	2.78	29
Philadelphia PHL	17.05	7	9.85	3	17.05	6	9.85	3
New York JFK	16.72	8	7.60	6	16.72	7	7.60	5
Los Angeles LAX	15.90	9	6.24	12	15.90	8	6.24	11
Denver DEN	14.53	10	5.03	20	14.53	9	5.03	20
Atlanta ATL	14.25	11	8.25	4	14.25	10	8.25	4
Las Vegas LAS	14.24	12	4.51	24	14.24	11	4.51	24
Phoenix PHX	14.23	13	5.54	16	14.23	12	5.54	16
Miami MIA	13.86	14	5.45	18	13.86	14	5.45	18
Seattle SEA	13.82	15	4.64	23	13.82	15	4.64	23
Orlando MCO	13.71	16	3.99	25	13.71	16	3.99	25
San Diego SAN	13.22	17	3.27	27	13.22	17	3.27	27
Baltimore BWI	13.15	18	3.56	26	13.15	18	3.56	26
Cincinnati CVG	12.72	19	5.07	19	12.72	19	5.07	19
St. Louis STL	12.37	20	6.25	11	12.37	20	6.25	10
Tampa TPA	12.28	21	3.12	28	12.28	21	3.12	28
Houston IAH	11.40	22	5.65	15	11.40	22	5.65	15
Dallas DFW	11.33	23	6.97	9	11.33	23	6.97	8
Detroit DTW	11.22	24	7.30	8	11.22	24	7.30	7
Washington DCA	11.03	25	5.48	17	11.03	25	5.48	17
Pittsburgh PIT	10.97	26	4.86	22	10.97	26	4.86	22
Salt Lake City SLC	10.84	27	5.03	21	10.84	27	5.03	21
Minneapolis MSP	10.75	28	6.57	10	10.75	28	6.57	9
Charlotte CLT	10.15	29	5.75	14	10.15	29	5.75	13

Notes:

Delays from FAA APO CODAS for 12 months ending November 2000.

Overall, this analysis of the interdependencies between airport delays leads to a number of conclusions:

- Logan-caused runway and taxiway delays are the most appropriate measure for evaluating the relative benefits of the proposed Airside Project improvements. While these delays represent the largest portion of Logan delays, Logan is also impacted by delays at other airports.
- Logan-caused runway and taxiway delays account for approximately 70 percent of total capacity-related delays for Logan flights; but the significant proportion of delays caused by other airports indicates a strong relationship between Logan delays and delays at other airports in the national air transportation system.
- This relationship means that improvements at Logan have benefits for air transportation as a whole, and that delay reduction initiatives at other airports will provide benefits to Logan passengers.
- The Preferred Alternative provides a significant benefit, and would have improved Logan's national CODAS delay rankings from third to thirteenth in terms of arrival delays, and from fifth to fourteenth in terms of total delays, assuming no improvements at other airports.

1.4.3 FAA Measures to Reduce Delays Nation-wide.

FAA efforts to improve safety, to reduce congestion and delays, and to accommodate a growing volume of air traffic within the national airspace system are continuing on several fronts: airport development, airspace design, air traffic operational procedures and system modernization.³⁰

Improving airport infrastructure is the most direct and effective means of reducing delays. FAA efforts in this area include studies of airport delays and potential improvements, review of airport proprietary improvement initiatives at existing airports, funding airport development through the Airport Improvement Program (AIP) and Passenger Facility Charges (PFCs), development of new airports, and conversion of military airfields to civil use.

National Airspace Redesign (NAR) is an ongoing FAA activity to reduce delays by providing more efficient handling of current and future aircraft flows. The NAR Program is addressing existing chokepoints as well as introducing enroute alternatives. Other efforts involve consolidating Terminal Radar Approach facilities for more efficient control, and developing Area Navigation Routes which are not constrained by fixed ground-based navigational facilities.

Improved operational procedures are being developed and implemented to maximize the capacity of existing or planned airports and airspace. Some specific items in process are



30 2000 Aviation Capacity Enhancement (ACE) Plan, FAA Office of System Capacity, December 2000.

reducing the required vertical or horizontal separations between aircraft, increasing civilian access to military special use airspace, implementing GPS approaches, removing the 250-knot airspeed limit below 10,000 feet, Simultaneous Offset Instrument Approaches (SOIA) to closely spaced parallel runways, and greater use of Land and Hold Short Operations (LAHSO).

To handle the growing demand on the air traffic system and associated delays, the FAA has prepared a long-term plan for National Airspace System (NAS) Modernization. The concept of Free Flight is the impetus for many of the elements of NAS Modernization. Free Flight will give pilots more flexibility in determining routes and speeds. Future NAS users will face fewer enroute restrictions—and thereby fewer delays—in their flight operations. The NAS Modernization Plan contains many interrelated projects, which are described in detail as “NAS Architecture”.³¹ The Plan includes a combination of hardware, software, new technology, procedural innovations, and collaborative decision-making that will increase system efficiency and reduce delays.

1.5 Logan’s Role in the Regional Economy

Efficient aviation facilities are a critical component of a region’s economic system and structure. As the largest airport in the six-state New England region, Logan provides air passenger and cargo services to international and domestic destinations, which play a significant role in the Boston and New England economies. This section discusses the importance of convenient air service to the local and regional economies, as well as the effects of Logan as an economic entity that provides employment and other direct and indirect benefits to the economy.

1.5.1 Boston’s Need for Efficient Air Travel

The New England economy is largely based on a mix of travel-intensive service industries that depend on high-quality air transportation services. As illustrated in Table 1.5-1, the economies of Boston and the Commonwealth of Massachusetts have higher proportions of employment in the services and finance, insurance, and real estate sectors, than the nation as a whole. Section 1.2.1 of the Airside Project Draft EIS/EIR provides a more detailed description of the service industry in the region, including the number and names of major employers.

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The complete NAS Architecture 4.0 and a summary called the Blueprint for NAS Modernization are posted on the FAA web site at www.faa.gov/nasarchitecture.

Table 1.5-1
Share of Employees by Industry Sector

Industry Sector	Boston	MA	US
Services	40%	36%	30%
Wholesale and Retail Trade	22%	23%	23%
Manufacturing	11%	14%	15%
Government	11%	12%	15%
Finance, Insurance, Real Estate	8%	7%	6%
Construction and Mining	3%	4%	5%
Transportation, Communications and Utilities	4%	4%	5%

Source: US Department of Labor, Bureau of Labor Statistics, Employment and Earnings, September 1998.

The major service industries in the region include financial services, research and development, higher education, consulting, high technology, and health care and medical services. All of these industries are travel intensive because they operate in national and global markets with clients around the world. These industries often involve collaborative efforts among individuals or corporations that work closely together despite distances. Boston's hospitals and medical services are internationally recognized and highly rated, and therefore draw patients from around the world. As a global center for these industries, the region also hosts related conferences and conventions. Similar large gatherings from many other industries are drawn by the region's historic, cultural and natural attractions.

1.5.2 Tourism and the Regional Economy

Tourism is a key sector of the local and regional economies, and tourists that arrive by air typically spend more, stay longer, and provide more economic benefits to the region than those arriving by other modes. In Massachusetts, approximately 108,000 full-time jobs are created by the tourism industry, and 30,000 of these are located in Boston.³² The number of visitors to the Greater Boston area has increased by 5 percent annually between 1992 and 1997, rising from 8.8 million to 11.1 million.³³ Visitors come from all over the US and the world. Over half of Boston's US visitors come from outside New England and more than one-fourth arrive by air. More than a million international visitors (excluding residents of Canada and Mexico) come to Boston annually, each spending an average of \$1,400 during their stay.³⁴

1.5.3 Logan is a Major Employer and Economic Catalyst

In addition to supporting the intercity travel needs of the region's businesses and facilitating the tourism trade, Logan itself is a major contributor to the regional economy. Activity at Logan generated an estimated \$1.4 billion in direct economic benefits and

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 32 1997 Fact Sheet, Greater Boston Convention and Visitors Bureau
 33 1998 Fact Sheet, Greater Boston Convention and Visitors Bureau
 34 1997 and 1998 Fact Sheets, Greater Boston Convention and Visitors Bureau

\$5.0 billion, or an average of \$13.6 million every day, in total economic benefits during Fiscal Year 1998 (see Table 1.5-2).³⁵

As owner and operator of Logan Airport, Massport provides most of Logan's major facilities, leases land and building space to other businesses at the airport, and coordinates ground access services to Logan. Massport employs more than 700 people at Logan. Massport is also continually planning for the airport's future needs through capital investment programs and is responsible for financing the facilities, as well as raising the necessary capital by leveraging revenue primarily from fees and rentals paid by airport users. Some airport costs are partly offset by federal grant money.

More than 60 airlines serve Logan and some 100 aviation-related businesses provide airport support services. Passenger travel services are augmented by restaurants and retail shops in the terminals; hotels; banks; medical offices; rental car agencies; and limousine, bus and taxi services. Of the 15,000 people working at Logan, only about 5 percent are employed by Massport, with the remaining 95 percent are employed by private industry and other government entities. In addition to the direct economic impacts of these activities at Logan, indirect benefits are generated as the tourist and supplier industries support the air transportation business at Logan. Additional economic activity and jobs, generated by these employees through the "multiplier" effect as they spend their paychecks, are included in the \$5.0 billion of total economic benefits generated by Logan each year (see Table 1.5-2).

Table 1.5-2
Estimated Economic Impact of Logan - Fiscal Year 1998

Activity	Amount in \$ millions
Direct Economic Benefits:	
Employee Payroll and Benefits from Direct Activity	\$ 713
State and Local Tax Revenue from Direct Activity	84
Mass Turnpike Authority Tolls and MBTA* Fare Revenue	31
Public and Private Expenditures of Facility Tenants and Operators	381
Direct Income to Select Companies/Tenants	<u>162</u>
Subtotal Estimated Direct Economic Benefits	\$1,371
Indirect and Induced Economic Benefits:	
State and Local Tax Revenue from Indirect Facility Activity	\$ 178
Visitor Expenditures	2,467
Travel Agency Commissions	298
Income Multiplier (on Employee Payroll and Benefits only - net of taxes)	<u>654</u>
Subtotal Estimated Indirect and Induced Economic Benefit	\$3,597
Total Estimated Economic Benefits	\$4,968

* MBTA -- Massachusetts Bay Transportation Authority

Source: Massachusetts Port Authority, Economic Impact Analysis, Fiscal Year 1998.

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35 Economic Impact Analysis, Massport, Fiscal Year 1998.

1.6 Cost of Delay on Logan Users

Delays at Logan impose substantial costs on airlines and passengers. Massport estimates that Logan flight delays cost airlines and passengers more than \$300 million in 1998. When flights are delayed, the following types of costs are incurred:

- Airlines experience additional operating costs such as increased fuel, maintenance and crew costs;
- Passengers onboard the aircraft risk missed connections and lose personal or work-related time.

Additional costs, that have not been quantified, accrue to people waiting to meet delayed passengers and to shippers who may miss important flight or delivery times. Additional discussion of the costs of delay was provided in Section 1.6 of the Airside Project Draft EIS/EIR.

1.6.1 Cost of Delay to Airlines

The costs associated with delay are often difficult to quantify and require the use of different metrics. The magnitude of airport user costs can be estimated from data on airline operating costs and from FAA statistics on the value of time. Based on these metrics, the estimated airline cost per hour of delay ranges from \$348 for a representative regional carrier non-jet aircraft³⁶ up to \$1,585 for a representative 150-seat jet. Given the mix of aircraft operating at Logan, the average airline cost of delay is estimated at \$1,115 per hour.

1.6.2 Cost of Delay to Airline Passengers

When flights are delayed, passengers incur lost time. The average passenger aircraft at Logan enplaned (or deplaned) 53 passengers in 1998.³⁷ On average, when a Boston aircraft is delayed by a single hour, 53 passengers each lose one hour of time. In a 1997 FAA Office of Aviation Policy and Plans (APO) Bulletin, the US DOT/FAA recommended the use of a \$27 per hour value of time³⁸ for the evaluation of regulatory programs impacting airline passengers. Using this value, the average economic cost to airline passengers for a single hour of aircraft delay is \$1,431 per flight.

1.6.3 Total Cost of Delay

Considering the impact of delay on both airline operating costs and lost passenger time, the total cost of delay at Logan is estimated at approximately \$2,500 per hour, producing



³⁶ Regional aircraft costs reflect a blend of 19-seat Beech-1900 and 34-seat Saab 340. In 1998, these were the most prevalent regional aircraft at Logan.

³⁷ Massport statistics.

³⁸ US DOT/FAA, "Treatment of Values of Passenger Time in Economic Analysis," *APO Bulletin* (APO-97-1), June 1997.

an annual cost of more than \$300 million in 1998.³⁹ The hourly cost of delay can be applied to the estimated hours of delay reduction that will result from the various Airside Project Alternatives, in order to quantify the benefit associated with each.

1.7 Federal/State Purpose of this Supplemental DEIS/FEIR

This Supplemental DEIS/FEIR, like the Airside Project Draft EIS/EIR, was jointly prepared by the FAA and Massport. Because this Supplemental DEIS/FEIR and the Draft EIS/EIR form parts of the federal record of compliance with the National Environmental Policy Act (NEPA) and related provisions of federal law, both have been prepared under the control and responsibility of the FAA.

Massport is the proponent of all the actions studied in this Supplemental DEIS/FEIR with the exception of the proposed reduction in approach minimums on Runways 22L, 27, 15R, and 33L. FAA is the proponent of the reduced approach minimums. FAA also has primary federal jurisdiction and responsibility with regard to regulatory review and approval of airport layout plans, and airport improvement program grants of financial assistance for such projects. Therefore, FAA is acting as the lead federal agency under NEPA with responsibility for preparing this Supplemental DEIS. The Massachusetts Executive Office of Environmental Affairs, MEPA Office, is the reviewing agency for the Final EIR.

1.7.1 NEPA/MEPA History of the Airside Project

A range of Logan-specific alternatives to reduce congestion and delay and enhance safety and efficiency at Logan have been considered in the Logan Airside Improvements Planning Project (Airside Project). The Project was initiated in 1993 as a feasibility study that examined the nature of delays at Logan and evaluated the potential delay savings and efficiency and safety enhancements for a range of improvement concepts.⁴⁰ The concepts evaluated in the Airside Improvements Feasibility Study evolved from alternatives considered in previous studies, most notably the FAA's *Boston Logan International Airport Capacity Enhancement Plan* (CEP) published in October 1992. Additional sources for the concepts included the *Logan Runway Incursion Mitigation Plan/Taxiway Relocation Study* (December 1993) and recommendations by Massport staff, airlines, and the Air Transport Association (ATA).



³⁹ Estimated annual cost is for runway delay only.

⁴⁰ *Logan Airside Improvements Feasibility Study, Phase I Report*, prepared by Jason M. Cortell Associates, Inc. for the Massachusetts Port Authority, July 20, 1995.

Based on the results of the Airside Improvements Feasibility Study completed in 1995, the Massport Board in July 1995 selected seven improvement concepts for advancement of a more detailed operational and environmental analysis through a joint federal and state EIS/EIR. The seven alternatives were presented in the Environmental Notification Form (ENF) for the Airside Project and further developed during the federal and state EIS/EIR scoping process. Consistent with the federal and state scopes, the Airside Project Draft EIS/EIR assessed the following improvement concepts:

- Construction of a unidirectional Runway 14/32;
- Construction of a Centerfield Taxiway;
- Extension of Taxiway Delta;
- Realignment of Taxiway November;
- Optimization of taxiways in the southwest corner of the airfield;
- Reduction in approach minimums on Runways 22L, 27, 15R, and 33L; and
- Implementation of Peak Period Pricing.

The analytic framework for assessing the various alternatives was structured to provide a comprehensive assessment of improvement concept packages.

Out of the possible alternatives, Alternative 1A emerged as the one best able to satisfy the Airside Project's purpose and need. If available in 1998, Alternative 1A would have reduced delays during northwest wind conditions by nearly 90 percent. Alternative 1A, the Preferred Alternative includes all actions analyzed with the exception of Peak Period Pricing.

The Preferred Alternative reduces delays without unnecessarily imposing the economic costs associated with Peak Period Pricing on regional carriers and small communities. Airline overscheduling is not currently a problem at Logan but could emerge in the future. Massport has designed a Peak Period monitoring system for early identification of airline overscheduling, and will initiate a Peak Period Pricing program if warranted by future conditions.

The Preferred Alternative significantly reduces congestion and delay at Logan particularly during northwest wind conditions; achieves important air quality and noise benefits; and increases the safety and efficiency of airfield operations.

There is no feasible and prudent alternative to the Preferred Alternative that would achieve the purpose and need of the Airside Project. The Preferred Alternative is part of a broader program that includes aggressive development of regional options to relieve Logan and all reasonable steps to minimize adverse effects of airport operations.

On February 1, 1999, Massport and the FAA jointly submitted the Airside Project Draft EIS/EIR that analyzed proposals contained in the Logan Airside Improvements Planning Project. After careful review of the extent and causes of delay at Logan, the Airside Project Draft EIS/EIR evaluated the likely level of delay and the environmental implications if nothing is done. This evaluation was completed using state-of-the-art delay modeling techniques and reflected the range of likely activity levels at Logan over the coming decades and the projected role played by regional airports and rail to divert traffic which would otherwise utilize Logan.

A Notice of Availability of the Airside Project Draft EIS/EIR was published in the *Federal Register* on February 26, 1999 and in the *Environmental Monitor* on February 23, 1999. The state and federal comment periods, which started on the notification dates, ended on April 22 and April 23, 1999, respectively. Public Hearings were held by the FAA on April 7, 1999 at the State Transportation Building in Boston and on April 8, 1999 at the Holiday Inn in East Boston.

On May 7, 1999, the Secretary of Environmental Affairs issued a Certificate on the Airside Project Draft EIR which determined that the Draft EIR adequately and properly complied with the Massachusetts Environmental Policy Act (M.G.L. c. 30, §§ 61 - 62H) and with its implementing regulations (301 C.M.R. 11.00) and provided specific direction for additional analysis to be included in the Final EIR.

In January 2000, after reviewing a draft Final EIS, the FAA requested preparation of a Supplemental Draft EIS to address a series of specific issues. At the FAA's direction, an SDEIS panel was formed consisting of three members appointed by the Governor of the Commonwealth of Massachusetts and three members appointed by the Mayor of the City of Boston. Under the direction of the New England Region FAA, the SDEIS panel convened in March of 2000 and held 12 formal meetings and five informational visits to the regional airports and the Logan air traffic control tower. To provide appropriate background, the SDEIS Panel was presented with an Interim Supplemental Draft EIS; answers to key letters written by members of the public, concerned agencies and public officials responding to the Draft EIS/EIR; and a series of 15 visual and written presentations from the Airside Project's technical consulting team and other independent industry experts. Based on the SDEIS Panel process, the FAA developed specific additional analytic tasks to be included in this Supplemental Draft EIS. (The FAA task directive and minutes from the SDEIS Panel meetings are contained in Appendix A of this Supplemental DEIS/FEIR).

This document includes the additional analysis identified by the FAA as a result of the SDEIS Panel review process and constitutes the Supplemental Draft EIS. This document also responds to the EOEA May 7, 1999 Certificate on the Airside Project Draft EIS/EIR and includes separate volumes containing responses to individual comment letters received on the Airside Project Draft EIS/EIR.

1.7.2 FAA Determinations

1.7.2.1 NEPA Record of Decision

Final FAA NEPA determinations are to be made in the FAA Record of Decision following completion of the EIS process.

1.7.2.2 FAA's Regulatory Determinations

Pursuant to FAA's regulatory responsibilities, this Supplemental Draft EIS sets forth evidence demonstrating that:

- (a) The project is reasonably consistent with existing plans of public agencies for development of the area;
- (b) Fair consideration has been given to the interests of communities in or near the project location;
- (c) Appropriate action has been or will be taken to restrict, to the extent reasonable, the use of land in the vicinity of the airport to purposes compatible with airport operations;
- (d) Appropriate air and water quality requirements will be satisfied; and
- (e) The action is consistent with the approved state coastal zone management program.

1.7.2.3 FAA's 4(f) Assessment

As set forth in this Supplemental DEIS/FEIR, the Preferred Alternative will not use any publicly owned land from a public park, recreation area, wildlife or waterfowl refuge, or land of an historic site. As a result, a Section 4(f) finding is unnecessary.

1.7.2.4 FAA's Non-Applicability Finding with Respect to Clean Air Act Conformity

There are no adverse air quality impacts associated with the Preferred Alternative. In fact, the Preferred Alternative provides air quality benefits when compared to the No Action Alternative. Under Section 176(c) of the Federal Clean Air Act, 42 U.S.C. § 7506(c)(1), the FAA is prohibited from engaging in, supporting in any way, or providing financial assistance for, licensing or permitting, or approving any activity that does not conform to a state implementation plan (SIP). Massport is seeking various FAA approvals for the Preferred Alternative at Boston-Logan International Airport in Boston and Winthrop, Massachusetts. Massachusetts has developed a SIP to achieve attainment of the National Ambient Air Quality Standard (NAAQS) for ozone and a SIP maintenance plan to maintain the NAAQS for carbon monoxide (CO). The Massachusetts SIP lays out a program of controls which seek to control CO emissions directly, and seeks to reduce ozone by reducing emissions of the ozone precursors volatile organic compounds (VOC) [or non-methane hydrocarbons] and oxides of nitrogen (NO_x).

1.7.2.5 ALP Approval

The FAA examines, prior to issuing an airport layout plan (ALP) approval or approving financial assistance, whether the Preferred Alternative conforms to the Massachusetts State Implementation Plan's (SIP's) purpose of controlling CO and ozone precursor emissions. For purposes of Section 176(c), the Preferred Alternative is a non-transportation project, subject to the general conformity regulations, 40 C.F.R. Part 51, Subpart W and 40 C.F.R. Part 93, Subpart B.

The Preferred Alternative would not cause emissions that exceed annual General Conformity threshold levels, nor is it a regionally significant action; therefore the proposed action is presumed to conform to the SIP. By reducing congestion and delay in aircraft operations, the Preferred Alternative is expected to reduce CO and VOC emissions under predicted future conditions.

Since the Preferred Alternative will result in a net reduction of emissions over the No Build alternative for both the 29M Low Fleet and the 37.5 M High Fleet scenarios, the project advances the purposes of the Massachusetts SIP. Because the Preferred Alternative will not cause or contribute to any NAAQS violation in any area, and will not delay timely attainment of any NAAQS or any required emission reductions or other milestones in any area, the FAA finds that the Preferred Alternative conforms with the Massachusetts SIP, with the statutory requirements of 42 U.S.C. § 7401 and 7506(c)(1), and with the regulatory requirements of 40 C.F.R. Part 51, Subpart W and 40 C.F.R. Part 93, Subpart B.

1.7.2.6 FAA's Determination Regarding Environmental Justice

For the reasons set forth in Section 6.8 of this Supplemental DEIS/FEIR, the FAA concludes that the Preferred Alternative does not have a high and adverse disproportionate impact on populations protected by federal environmental justice policies. FAA has committed to approve and fund under the Airport Improvement Program, sound insulation of all residences falling within the predicted 65 dB Day-Night Sound Levels (DNL) contour for the Preferred Alternative under the 29 M Low Fleet scenario, the worst case scenario in terms of noise exposure levels. This includes all areas within the City of Chelsea that would be newly included in the 65 dB DNL contour with the Preferred Alternative. The FAA commitment will be set forth in the Record of Decision. Massport has committed to sponsor and pay for the state's share of sound insulation costs.

1.8 Conclusion

By every available measure of delay, Logan has a serious delay problem. In 2000, Logan was the 6th most delayed airport in the US based on FAA OPSNET statistics, yet it ranked 12th in terms of total aircraft operations. FAA data indicate that Logan's record for arrivals is even worse, ranking as the 2nd most arrival-delayed airport in the nation.

Logan generally operates on three-runway configurations that can accommodate approximately 120 aircraft operations per hour. Most Logan delays occur when wind or weather conditions require all aircraft arrivals and departures to be accommodated on two or fewer runways, producing a substantial decline in airfield operating capacity. As described in the Airside Project Draft EIS/EIR and the following chapters, the Preferred Alternative includes construction of unidirectional Runway 14/32, which would correct an underlying limitation of the Logan airfield – the lack of a third available runway in the northwest/southeast operating direction—and allow normal operational capacity to be maintained during northwest wind conditions. With construction of Runway 14/32, the Preferred Alternative will address the most preventable cause of serious delays at Logan Airport.

It is clear that growth in the Boston and regional economies will continue to stimulate increasing demand for air transportation services at Logan. The challenge faced by Massport and the FAA is to safely and efficiently accommodate current and future levels of demand in an environmentally responsible manner, given the existing physical and operational constraints at Logan. The Airside Project Draft EIS/EIR explored actions that Massport and the FAA can take to improve operational efficiency and enhance safety at Logan. The individual improvements and alternative packages, including the Preferred Alternative, are discussed in Chapter 3 of this Supplemental DEIS/FEIR.

The following chapter of this Supplemental DEIS/FEIR examines the emerging role that regional airports and high speed rail will play in absorbing an increasing portion of the region's air travel demand, and assesses the impact of these regional options on the need for airside improvements at Logan.

2

Logan's Role in the Regional Transportation System

Key Points

Many comments received on the *Airside Improvements Planning Project Draft Environmental Impact Statement/Environmental Impact Report*¹ (Airside Project Draft EIS/EIR) focused on regional transportation issues and the importance of planning for Boston-Logan International Airport in a regional context. These comments were reiterated by the Federal Aviation Administration (FAA) appointed Supplemental Draft EIS Panel (SDEIS Panel) throughout the nine-month review process. The SDEIS Panel repeatedly voiced the need for ongoing regional planning by all relevant regional transportation agencies. In response to the high level of public interest and concern, this chapter expands upon the regional transportation analysis that was presented in the Airside Project Draft EIS/EIR and reports on the progress of regionalization efforts. Specifically, this chapter describes the impact that regional transportation options are having on Logan Airport, the role that Logan plays in a regional system, and planned initiatives to promote a coordinated regional transportation system.

- For more than a decade, transportation planning studies have recommended a regional transportation strategy for New England that includes an expanded role for the regional airports, high-speed inter-city rail as an alternative to air travel, and physical improvements at Logan Airport.
- The region has made considerable progress towards achieving the vision of these regional transportation studies. Substantial capital investments and marketing initiatives have increased passenger acceptance and use of regional airport options to Logan Airport. The December 2000 launch of Amtrak's Acela service will provide Boston-New York passengers with high-speed rail service, another option to Logan Airport service. These accomplishments will divert considerable air passengers from Logan Airport to other regional airports or travel modes and will reduce the region's reliance on Logan for high-speed, intercity travel.
- Service expansion at T.F. Green/ Providence Airport to the south and Manchester Airport to the north has created regional air travel options in New England. By attracting a substantial level of airline services to short- and medium-haul² markets, these airports are not only recapturing passengers generated within their own primary

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1 *Airside Improvements Planning Project Draft Environmental Impact Statement/Environmental Impact Report*, Massport, February 1999.

2 Short-haul services are less than 750 miles, medium-haul services are 750 to 1,499 miles, and long-haul services are greater than 1,500 miles.

service areas, but are also absorbing demand from the periphery of Logan Airport's core service area.

- Massport's 1999 Passenger Survey confirms that aggressive service expansion at other regional airports, particularly the Manchester and T.F. Green/Providence Airports, is diverting passengers from the areas outside of Metropolitan Boston away from Logan Airport. The share of Logan air passengers with a trip origin in the geographic area outside Interstate-495 has decreased over time, from 22 percent in 1993, to 14 percent in 1999. Massport estimates that regional airports diverted 2.4 million passengers from Logan in 1999.
- Massport is enhancing the capabilities of Worcester Regional Airport and Hanscom Field to offer more choices to air carriers, general aviation users and the traveling public.
 - Since 1995, Massport has been working with the City of Worcester to market Worcester Regional Airport to air carriers. In January 2000, Massport assumed operating responsibility for this airport, and is committed to developing a critical level of air services. Massport has already been successful in attracting several new services to Worcester. These include Delta Connection service to Atlanta, American Eagle service to New York JFK, and Pan Am service to Orlando Sanford International Airport. These services and continued air service development will enable Worcester Regional Airport to attract a meaningful share of Logan Airport passengers from central Massachusetts and the Metro West suburbs of Boston.
 - Massport is also committed to maintaining Hanscom Field within the regional transportation system. Hanscom will continue to serve primarily as a general aviation reliever for Logan Airport, with regional carriers operating niche-commercial air services.
- Massport is promoting increased utilization of regional airports and high speed rail to accommodate a greater share of the region's inter-city travel demand.
- Convenient ground access to Logan Airport as well as the regional airports will promote an efficient regional transportation network. Several progressive ground access improvement projects at Logan, as well as T.F. Green/Providence, Manchester, and Worcester Regional airports, will likely reduce ground traffic congestion and improve the convenience of regional airports.
- Massport supports the regionalization of New England's transportation network and continues to work with aviation transportation agencies including the FAA, the Massachusetts Aeronautics Commission (MAC), other New England State Aviation Directors, and the regional airports, to ensure the efficient use of the region's transportation infrastructure. Massport, the FAA, and the regional airport directors have agreed to undertake an update of the 1995 New England Regional Airports Air Service Study. This *New England Airports System Study* will evaluate the impact of recent regional airport developments on Logan Airport, identify constraints to regional airport

growth, and highlight strategies for optimizing New England's regional aviation system.

- Every major regional transportation study has recognized that the proposed Airside Project improvements at Logan are critical to the success of an efficient regional transportation system in New England. Logan will continue to function as the region's primary airport, accommodating the core Metropolitan Boston demand and the region's demand for international and domestic long-haul travel. The Airside Project improvements that Massport and the FAA have proposed would rectify an underlying limitation of the Logan airfield that causes excessive delays in northwest wind conditions. While regional airports and rail are essential elements of a balanced and efficient inter-city travel network, they cannot relieve Logan delays that occur in specific weather conditions because of a shortcoming in the airfield geometry.

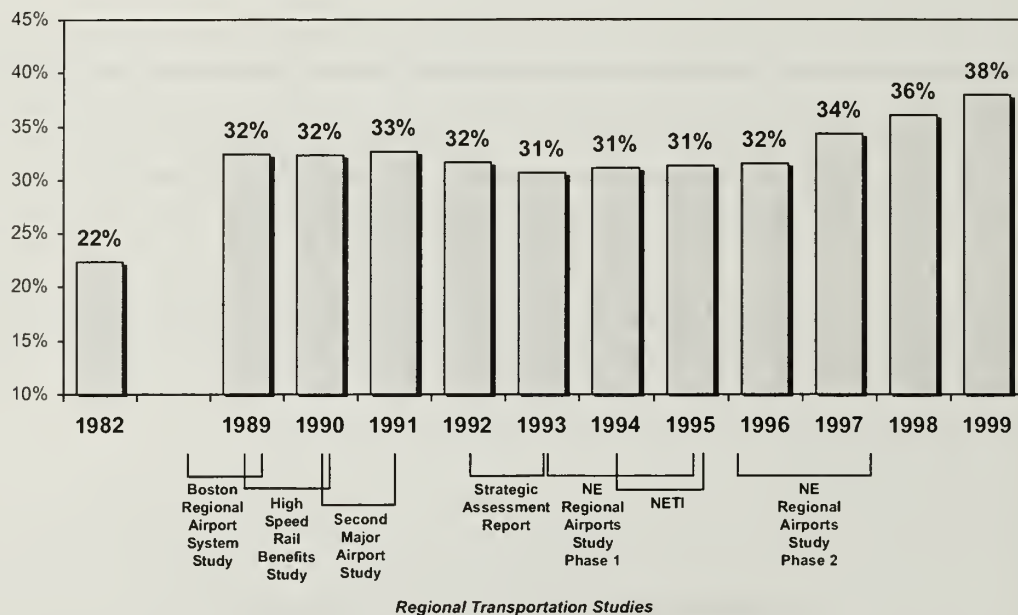
2.1 Overview

Even before the inception of the Airside Improvements Planning Project various concerned citizens and transportation planners have questioned whether increased utilization of other airports and high-speed rail would negate the need for Airside Project improvements at Logan. This question was also raised during the Supplemental DEIS Panel process. Both opponents and proponents of the proposed Logan Airside Project improvements agree that increased utilization of other facilities and modes is a necessary strategy for meeting the growing demand for inter-city travel and maintaining the region's economic success. But, even with high utilization levels, regional airports and high-speed rail would not reduce Logan's demand to levels that would solve Logan's delay problem.

Enhancing the region's transportation infrastructure requires continued development of regional transportation options and investment to improve the efficiency of Logan Airport. The analyses in the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR clearly demonstrate that regional airports and improved rail services are not "alternatives" but rather "complements" to the proposed infrastructure improvements at Logan. Regional airports and high-speed rail are part of a balanced and efficient regional transportation system. Developing and promoting these options will slow the growth in future demand for Logan Airport, but will not eliminate Logan's essential role in the regional transportation system.

Transportation planners have long identified the need for other airports and transportation modes to accommodate a greater share of the region's travel demand. Historically, Logan accommodated the majority of the region's demand for high-speed, inter-city travel, accounting for more than three-quarters of the region's air passengers in the early 1980s. Transportation agencies, including Massport, have actively pursued strategies to increase the use of regional transportation options with the goal of reducing the region's reliance on Logan Airport. Through a combination of these efforts and market forces, the regional airports have increased their share of New England's air passengers from 22 percent in the early 1980s to 38 percent in 1999 (Figure 2.1-1).

Figure 2.1-1
Regional Airports' Share of New England Air Passengers



Source: U.S. DOT, Form 41, Part 298/C and airport records.

While regional transportation options increase the efficiency of the overall transportation system, they do not diminish the need for an efficient Logan Airport. Logan plays a critical role in the regional transportation system by serving the Boston market area, which represents the largest concentration of population and commerce in the entire six-state region. As the most populous area in New England, Boston is also the region's largest generator of inter-city trips. In the global economy, high-speed access to distant markets on this continent and beyond is increasingly important to the region's economic success. Since the region's demand is primarily concentrated in the Boston area, Logan is the cornerstone of a regional transportation system and the principal airport for reaching distant long-haul domestic and international markets.

Ongoing efforts to improve regional transportation options are already changing the dynamics of inter-city travel to and from New England. Passenger traffic at the regional airports has increased by 13 percent per year since 1996, while Logan's passenger traffic grew by only 2.5 percent. As efforts to develop regional options have increased, Logan's share of the region's air passengers has declined from 68 percent in 1996 to 62 percent in 1999.

Although more passengers than ever are choosing regional airports and Logan's passenger growth has slowed, flight delays at Logan have not abated. The analysis conducted during this Airside Project EIS/EIR review process as well as all FAA and Department of Transportation (DOT) data, show a consistently high level of flight delays at Logan even as passenger growth has slowed.

While there are several causes of the delays that Logan passengers experience, a principal cause of Logan's delay problem is the inability of the airport to handle normal demand

during strong northwest winds. Proposed unidirectional Runway 14/32 is specifically designed to correct the underlying shortcoming in the airfield layout that causes excessive delays in northwest winds. There is no regional transportation alternative that could address the limitations in Logan's existing runway geometry and eliminate northwest wind delays.

Several regional transportation planning studies have concluded that regional transportation options and physical improvements at Logan are both essential for satisfying New England's transportation need. The region must work to expand transportation options and at the same time improve the efficiency of Logan Airport. This was reiterated by independent transportation experts who participated in the Supplemental DEIS Panel process. A truly regional transportation system cannot function without an efficient Logan Airport and Logan cannot operate efficiently if the source of northwest wind delays is not addressed.

The Airside Project Draft EIS/EIR presented a detailed description of Logan's role within the broader regional transportation network and an analysis of alternatives to Logan Airport that included regional airports, rail and videoconferencing. It was estimated that these alternatives could divert up to 7.3 million air passengers from Logan over the next decade.

The Secretary of the Executive Office of Environmental Affairs (EOEA) May 7, 1999 Certificate on the Airside Project Draft EIS/EIR³ requested that Massport report on the current status of ground access improvements at the regional airports and their potential impact on future passenger levels; update estimates of passenger diversion to regional alternatives; and summarize the environmental impacts of regional airport expansion. Based upon discussions during the SDEIS Panel process, the FAA also stressed the importance of regional system planning and requested that Massport expand the regionalization analysis by reporting on the planned New England Airports System Study. This study will identify additional regional strategies for reducing Logan delays, by adding historical context to regional planning issues, and by describing the on-going nature of regionalization efforts. This chapter responds to these concerns by:

- Summarizing key points from the Airside Project Draft EIS/EIR
- Describing the regionalization of air transportation in the eastern New England area and presenting an expanded regional transportation analysis
- Discussing the increasing role of the regional airports in accommodating the region's air travel demand and the evolving role for Logan within the regional airport system
- Addressing the roles that T.F. Green/Providence, Manchester, Worcester Regional, Hanscom, and Logan airports can play in the emerging regional aviation system
- Analyzing the potential Logan traffic relief that could be provided by Worcester Regional Airport

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The Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Certificate of the Secretary of Environmental Affairs on the Logan Airside Improvements Planning Project Draft Environmental Impact Statement/Environmental Impact Report, May 7, 1999.

- Summarizing the status of various rail projects and their potential to divert passengers from Logan
- Discussing the impact of all of the regional alternatives (regional airports and rail), on the future demand for Logan and the need for Airside Project improvements
- Reporting on the status of proposed ground access improvements at Logan, Manchester, T.F. Green/Providence and Worcester Regional airports
- Summarizing the documented environmental impacts of growth at the regional airports (See Appendix B of this Supplemental DEIS/FEIR)

The findings of this expanded regional analysis are consistent with the conclusions of the Airside Project Draft EIS/EIR: (1) even with increased utilization of the regional airports and high-speed rail, the demand for Logan services generated within its primary market area (inside I-495) will continue to grow; (2) in light of this continuing demand for air service out of Logan, delays will not improve solely as a result of increased utilization of regional airports and high-speed rail; and (3) Logan's current and projected level of delay can be relieved only through the additional Airside Project improvements that comprise the Preferred Alternative.

2.2 The New England Regional Airport System

2.2.1 Logan Airport's Role in the Regional Airport System

Boston is the largest metropolitan area and the center of commercial activity in New England. In 1999, there were 3.9 million people residing in the Boston metropolitan area, or 29 percent of New England's total population (Figure 2.2-1). Boston's high concentration of people, businesses, and attractions, makes it the largest generator of inter-city passenger trips in the region. Since air travel demand is primarily a function of the local population base, income levels, and economic activity, Boston's Logan Airport has naturally developed into the largest and busiest airport in the six-state region.

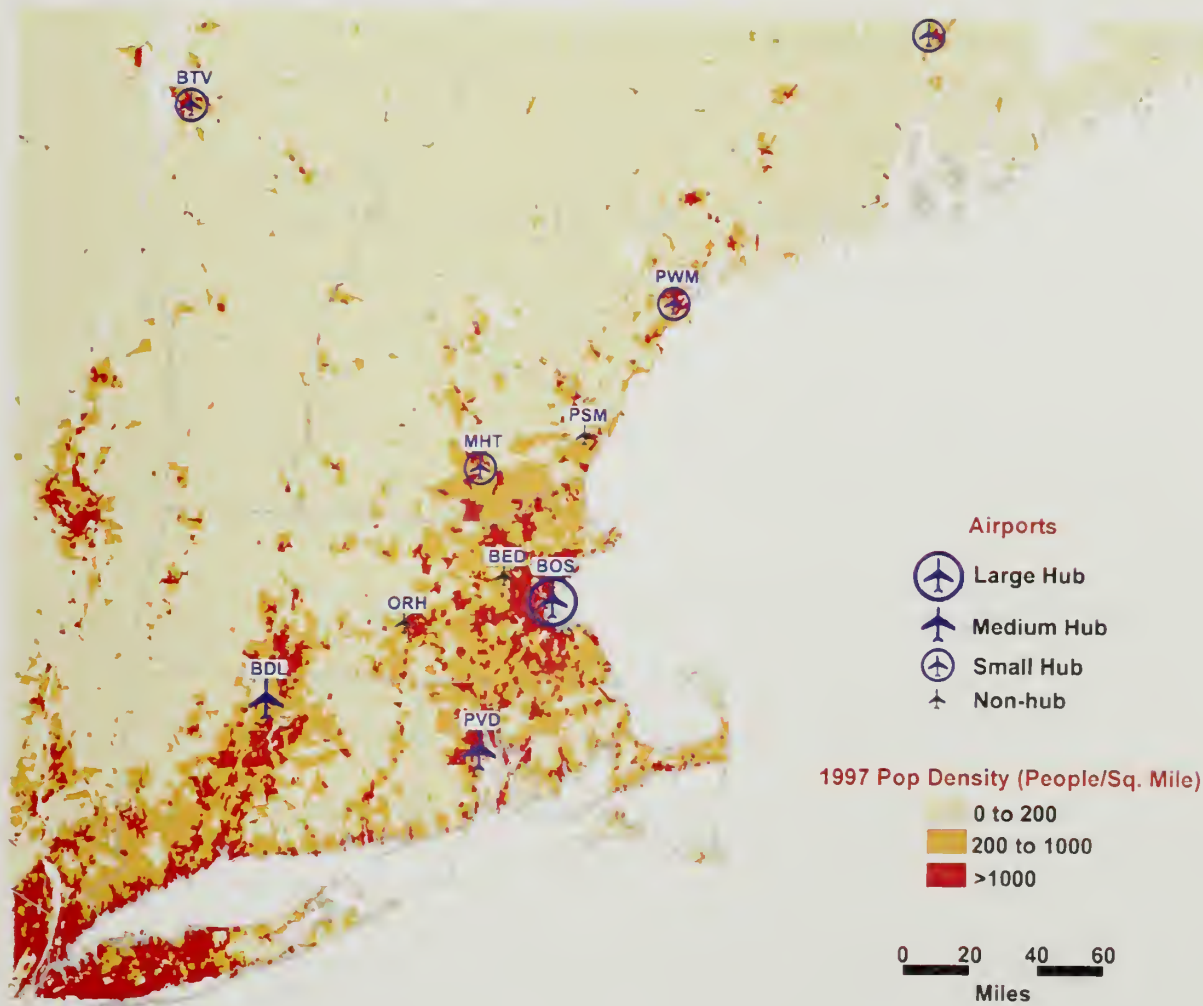
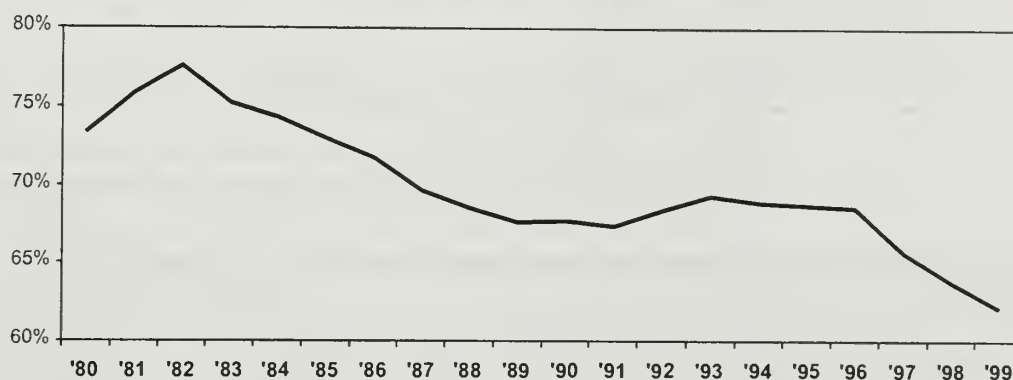


Figure 2.2-1

New England's Population is Highly Concentrated in the Metropolitan Boston Area

As Figure 2.2-2 shows, Logan historically has accommodated most of the air passenger activity in New England, in addition to the demand generated by the Boston area. In the early 1980s, Logan accounted for a disproportionate share of the region's air travel demand capturing more than three-quarters of New England's air passengers. By the late 1980s, Logan's passenger share declined to 68 percent as airlines responded to deregulation by adding services to other New England airports. However, in the early 1990s, when economic conditions weakened, air travel demand declined throughout the region. As a result, the regional airports failed to gain ground and Logan's passenger share remained constant at around 68 percent.

Figure 2.2-2
Logan's Share of Passenger Enplanements in New England



Note: Includes enplaned passengers at Logan, Hartford/Bradley, T.F. Green/Providence, Manchester, Portland, Burlington, Bangor, Tweed New Haven, and Worcester.

Source: US DOT, Form 41 and Part 298/C. Airport records for Logan and various regional airports.

Recognizing that the region's demand for air travel would grow over time and that Logan was becoming increasingly delayed, transportation planners began to develop regional transportation strategies to actively promote growth at the region's other airports and to develop alternative modes to air travel. Since 1989, a series of transportation planning studies, which are summarized in Table 2.9-2, examined regional transportation options for accommodating future demand. Many of these studies were cooperative efforts that reached across transportation agencies and state borders and involved public participation.

The outcome of the regional transportation studies was a shared commitment among the New England states, Massport, and other transportation agencies to develop and promote inter-city travel options throughout the region. Recommendations included increasing the use of underutilized airports and developing high-speed rail as an alternative mode to air travel. The studies also recognized Logan's central role in the region's intercity travel network and consistently concluded that landside and airside infrastructure improvements, which would improve the efficiency of Logan, were a critical component of a successful regional transportation strategy.

Many of the regional transportation strategies articulated by these studies are being implemented and are having a meaningful impact on intercity travel to and from New England. In terms of air travel, the region has further reduced its reliance on Logan Airport. In 1999, Logan enplaned 62 percent of the region's air passengers compared to 68 percent in 1990 and 78 percent in 1980. The decline in Logan's share is a result of coordinated efforts to increase air service options at the regional airports.

The growth exhibited by the regional airports is changing the role of Logan within the broader regional airport system. In the new regional environment, Logan is serving two primary functions. First, because of its proximity to the greatest concentration of travel demand in the region, Logan is the primary airport for passengers originating within Interstate 495. Logan is the best airport for serving the majority of the air travel needs of these passengers. It is not only the closest airport for most of these passengers, but it receives service from more airlines to more destinations than any other airport in New England.

Logan also functions as the primary airport for the long-haul⁴ domestic and international travel needs of the entire region. Currently, there is only a single daily flight from a regional airport to a long-haul domestic market⁵ and no scheduled flights to overseas destinations. Long-haul services have not developed at the regional airports, because the areas served by the regional airports lack a sufficient base of demand for travel to these destinations as well as connecting traffic. Opportunities for future growth in long-haul domestic and international services at the regional airports will be explored in the upcoming New England Regional Airport System Plan. For the foreseeable future, Logan is the only airport in New England that can serve as an international gateway for the region.

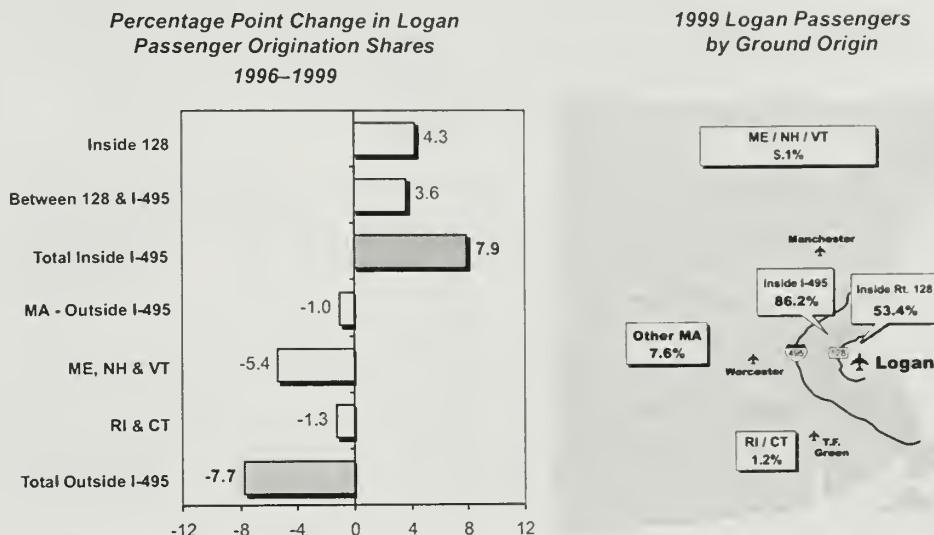
Logan's role as the primary airport for passengers that originate outside of I-495 has already diminished and is expected to diminish even further over time. Several of the regional airports have made considerable gains in obtaining direct services to short-haul high density markets and airline connecting hubs. Massport and the regional airport authorities are working together to ensure continued growth in air services at the regional airports.

The Logan Airport 1999 Air Passenger Survey, which tracks ground origin patterns of Logan Airport passengers over time, indicates that the geographic area which Logan serves has narrowed over time. As Figure 2.2-3 shows that in 1993 and 1996, approximately 20 percent of Logan's passengers originated from cities and towns outside of I-495. The most recent survey shows that in 1999 the share of Logan's passengers originating outside of I-495 decreased to just over 14 percent. These data confirm that aggressive service expansion at the surrounding regional airports is diverting passengers from Logan to the regional airports. The 1999 Air Passenger Survey data implies that approximately 2.4 million air passengers opted to use one of the regional airports instead of Logan.

▼
4 Long haul markets are markets that are over 1,500 miles in distance.

5 Southwest Airlines operates a daily flight from T.F. Green/Providence to Houston Hobby Airport in Texas. Additional long-haul domestic services are available at the Hartford/Bradley Airport, but, because of distance, this airport is not an option for air travelers in the Boston metropolitan area.

Figure 2.2-3
Logan's Passenger Demand is Concentrated within I-495



Source: Massport Logan Passenger Survey, 1996, 1999

In addition to expanded service options at the regional airports, high-speed rail is also expected to relieve some of the burden on Logan Airport. On December 11, 2000, Amtrak initiated its high-speed Acela service, between Boston's South Station and New York's Pennsylvania Station offering passengers an alternative mode to air travel. This service, which continues on to Washington, DC represents an attractive and competitive option to high-speed air travel in the Northeast Corridor. As this service develops and more trains are added to Amtrak's schedule, as many as 1.2 million passengers⁶ are expected to switch from air travel to rail travel, further reducing the region's reliance on Logan for travel to short-haul markets.

2.2.2 The Role of Regional Airports

In addition to Logan, the New England region is also served by several smaller commercial service airports throughout the six-state area (see Figure 2.2-4).⁷ The regional airports closest to Logan's core service area, defined as the region within Interstate 495, have the greatest potential for serving some of the demand that has historically used Logan Airport. These airports include the T.F. Green/Providence Airport to the south, Manchester Airport to the north, and Worcester Regional Airport to the west. In 1999, these airports accommodated a combined total of 8.0 million passengers, approximately 30 percent of Logan's passenger traffic. These have been among the fastest growing airports in New England. In 1997 and 1998, T.F. Green/Providence Airport and Manchester Airport, respectively, were the fastest growing airports in the nation. In

6 Final EIS/EIR and 4(f) Statement, Northeast Corridor Improvement Project, U.S. DOT, Federal rail Administration, October 1994.

7 The *New England Regional Airports Air Passenger Service Study* defined the Hartford, Providence, Manchester, Portland, Bangor, Burlington, Worcester and New Haven airports as the region's principal commercial airports, other than Logan Airport, since all of these airports either supported or had previously supported commercial jet passenger services. Limited commercial passenger service was subsequently introduced at Hanscom Field in Bedford, Massachusetts and at Pease International in Portsmouth, New Hampshire in 1999. Commercial service at Hanscom Field is on regional airline turboprop aircraft while Portsmouth is served with jet aircraft.

2000, passenger traffic at Worcester Regional Airport more than doubled as a result of Massport's aggressive efforts to attract new airline services to Worcester. The remarkable growth at these airports signals an important change in how the region's air travel demand is accommodated. Through extensive investments and growth in new, competitive services, the regional airports have become attractive service options and are capturing increasing numbers of passengers that have historically relied on Logan Airport.

In 1999, Manchester and T.F. Green/Providence remained the fastest growing airports in New England, with passenger levels increasing by 45 and 11 percent, respectively, over 1998 levels (see Table 2.2-1). Hartford/Bradley International, the largest of the regional airports, grew by only 2.1 percent in 1999, but growth for 2000 increased to double digits due to the initiation of Southwest Airlines' service at the end of 1999. Over the past decade, the Worcester Regional Airport experienced a steep traffic decline, but that trend was reversed in 2000. New airline services initiated at Worcester Regional Airport in February and July 2000 caused passenger activity levels to more than double from 50,000 in 1999 to 106,000 by the end of 2000.

Figure 2.2-4
Principal Commercial Service Airports in New England

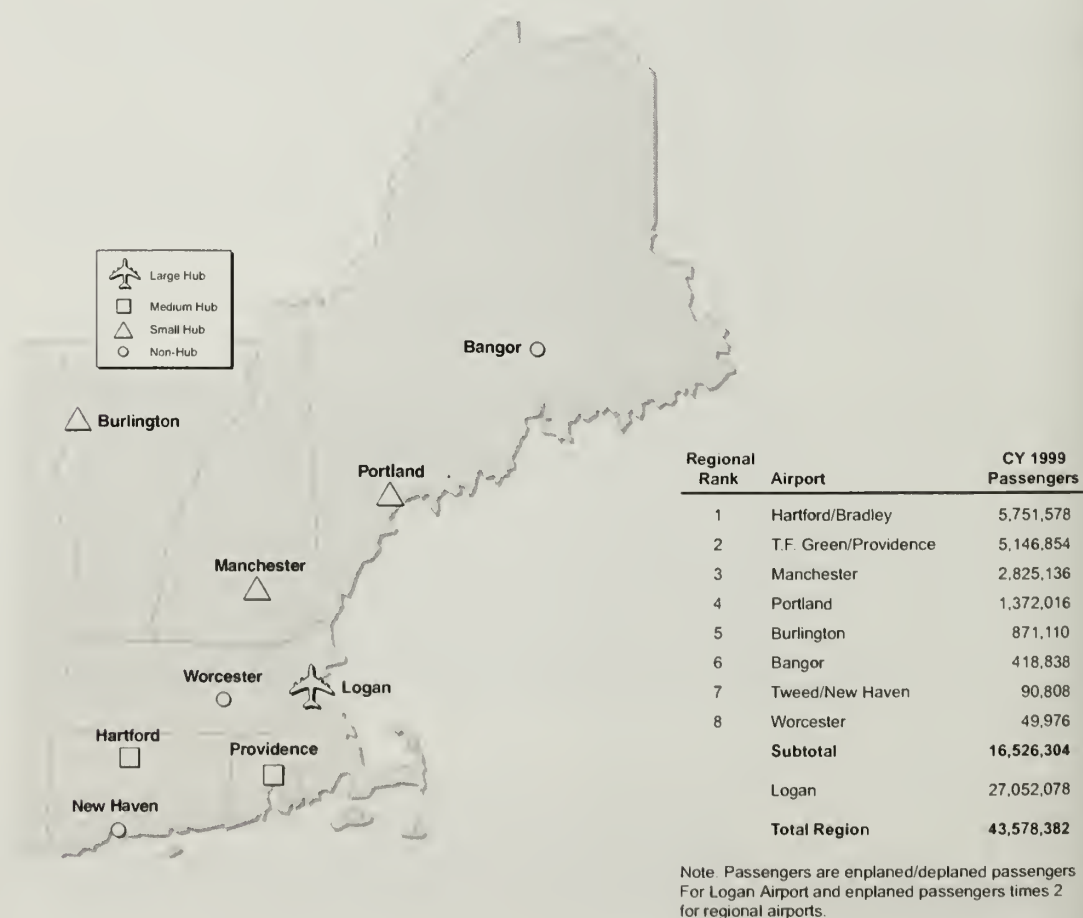


Table 2.2-1
Passenger Activity at New England Regional Airports and
Logan Airport – 1998 to 1999

Airport*	1998 Passengers** (millions)	1999 Passengers** (millions)	Percent Change	Percent of Total
Hartford Bradley International, CT	5.63	5.75	2.1	13.2
T.F. Green/Providence, Warwick, RI	4.62	5.15	11.3	11.8
Manchester, NH	1.94	2.83	45.4	6.5
Portland, ME	1.31	1.37	5.0	3.1
Burlington, VT	0.88	0.87	(0.8)	2.0
Bangor, ME	0.45	0.42	(7.7)	1.0
Tweed New Haven, CT	0.09	0.09	1.1	0.2
Worcester, MA***	<u>0.08</u>	<u>0.05</u>	<u>(35.2)</u>	<u>0.1</u>
Subtotal	15.01	16.53	10.1	37.9
Logan Airport+	26.53	27.05	2.0	62.1
Total	41.53	43.58	4.9	100.0%

Source: The New England Regional Airports – 1999 Annual Summary, Massport.

* New England airports that have historically supported regularly scheduled passenger services.

** Enplaned plus deplaned passengers.

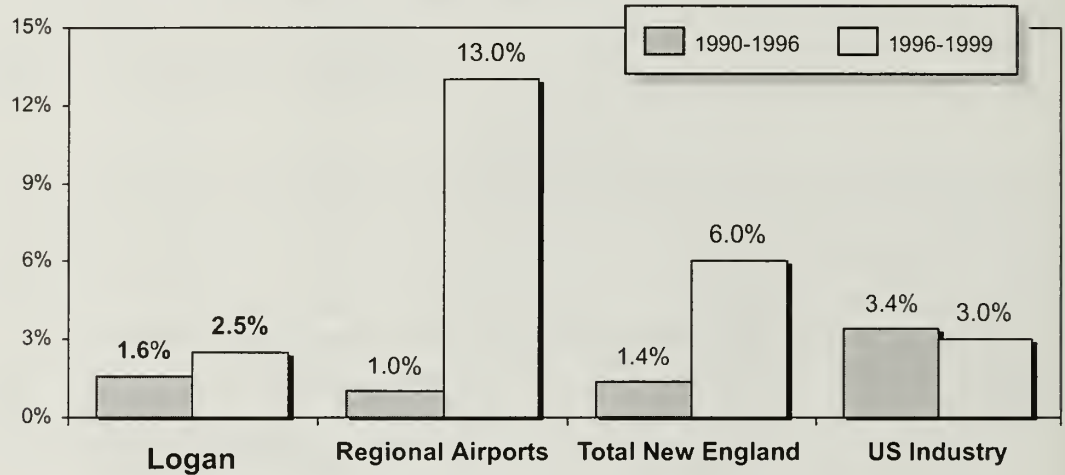
*** In 2000, Worcester Regional Airport passengers more than doubled from approximately 50,000 in 1999 to 106,000 passengers.

+ Includes international passengers.

From 1996 to 1999, passengers using the regional airports increased by 13 percent a year, while passenger traffic at Logan Airport increased by only 2.5 percent annually (Figure 2.2-5). This is in contrast to the period from 1990 to 1996, when Logan's passenger traffic increased by 1.6 percent and the regional airports grew more slowly, at 1.0 percent per year. The significance of this is that, since 1996, the regional airports began to accommodate an increasing share of the region's passenger traffic.

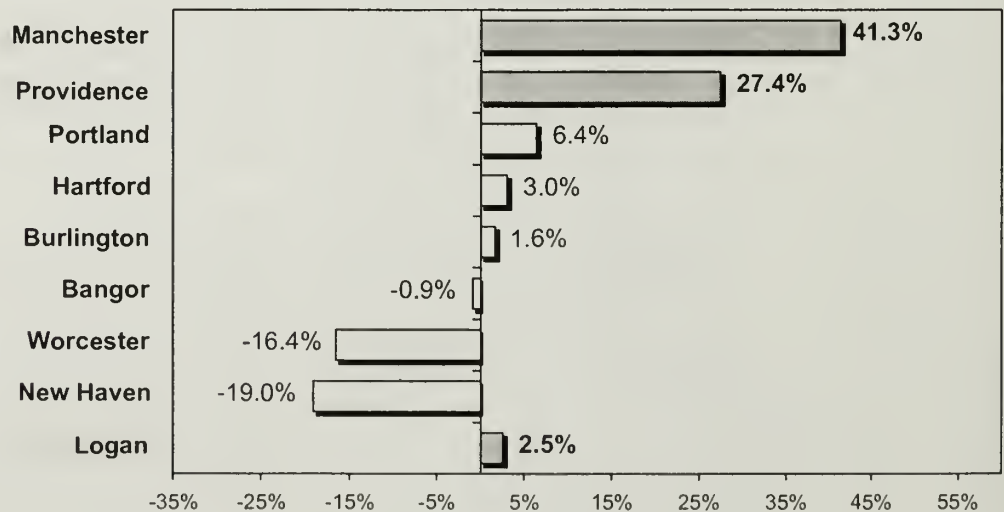
The regional airports have been able to increase their share of the region's travel demand because airlines have begun to change the way in which they serve the region. Historically, the airlines concentrated their services at Logan and only offered limited air services at the regional airports. Regional airport services were infrequent, higher-priced, operated with smaller, less desirable turboprop aircraft, and required connecting flights to reach most destinations. In 1996, the regional airports, particularly T.F. Green/Providence and Manchester, began to receive significantly improved services, including lower-priced flights, more frequencies, and more direct jet flights, due in part to marketing efforts by individual airports, as well as cooperative marketing efforts. As a result, these airports have experienced exceptional air passenger growth (Figure 2.2-6).

Figure 2.2-5
Comparison of Air Passenger Growth Trends for New England and the US – Average Annual Passenger Growth



Source: Massport, and FAA, FAA Aerospace Forecasts, various years.

Figure 2.2-6
Average Annual Passenger Growth by Airport– 1996 to 1999



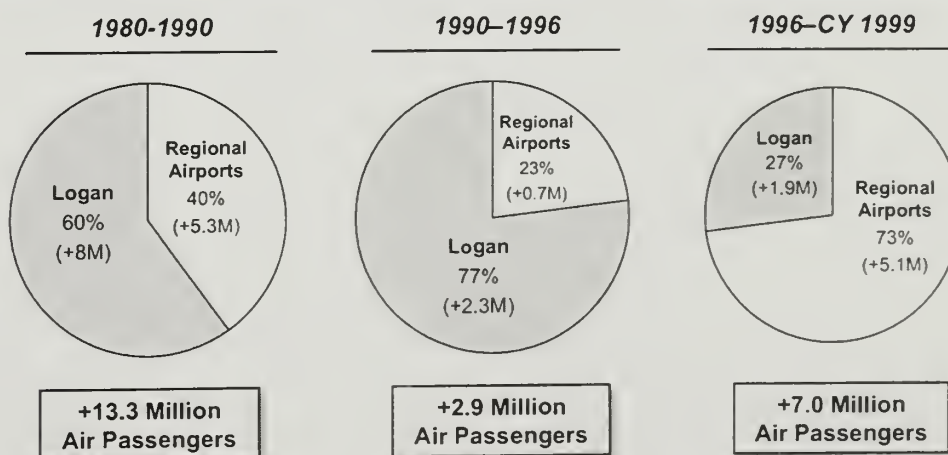
Note: Based on enplaned and deplaned passengers
 Source: Massport and regional airport authorities

The groundbreaking 1995 *New England Air Passenger Service Study*, which was the first study to assess air service opportunities from a regional perspective, identified the need for low-fare services at the regional airports. The study concluded that the introduction of low-fare, jet services would increase the utilization of the regional airports. If services at the regional airports were competitive with services at Logan, the regional airports would be able to attract passengers who originate within the regional airport service areas, but travel to Logan Airport for air service. This study led to the first cooperative air service marketing efforts in the region and a change in perceptions among airline planners as to how to serve the New England market.

Higher service levels have raised the profile of regional airports, particularly T.F. Green/Providence and Manchester, and transformed them into attractive options for many Logan Airport passengers. A major accomplishment has been the introduction of Southwest Airlines, the nation's premiere low-fare carrier, into the New England market. Southwest Airlines decided to avoid Logan Airport and to serve the Boston Metropolitan region by establishing operations at T.F. Green/Providence, Manchester and Hartford/Bradley International airports.⁸ This is further evidence that Logan and the regional airports are operating as a regional system of airports.

As Figure 2.2-7 shows, since 1996, the regional airports have accommodated most of the air passenger growth in New England. During the 1980s and the early 1990s, Logan accommodated 60 to 77 percent of the region's new passenger traffic. More recently, from 1996 to 1999, only 27 percent of the region's passenger growth occurred at Logan Airport and 73 percent occurred at the regional airports.

Figure 2.2-7
Distribution of New England Passenger Growth – Regional Airports vs. Logan



Note: Regional airports include Providence, Manchester, Worcester, Bangor, Burlington, Hartford, New Haven, and Portland.
Source: Airport Records and US DOT, Form 41 schedules.

▼
8 Southwest Airlines began service from Hartford/Bradley International Airport in 1999 with 12 nonstop departures per day.

Regional airports are playing a larger role in serving the region's demand because they have benefited from substantial increases in air service offerings over the last three years. The airports that have benefited the most by achieving a critical mass of competitive services are the ones closest to the core Boston Logan Airport service area, i.e. T.F. Green/Providence and Manchester airports.

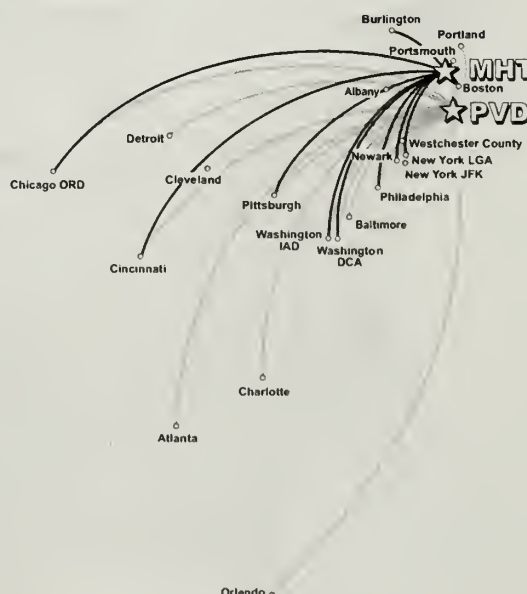
2.2.3 T.F. Green/Providence Airport

In October 1996, Southwest Airlines and Delta Express both commenced low-fare jet services at T.F. Green/Providence Airport.⁹ Southwest Airlines, which strategically offers low-fare, short-haul, high-frequency, point-to-point service, is the nation's fourth largest airline in passenger boardings. Figure 2.2-8 displays non-stop service from Providence (and Manchester) to key destinations in the eastern US. Southwest Airline's entry at T.F. Green/Providence Airport was also its first entrance into the New England market.

Figure 2.2-8

Comparison of Nonstop Jet and Turboprop Markets Served from T.F. Green/Providence and Manchester Airports— August 1995 and August 2000

August 1995 Service



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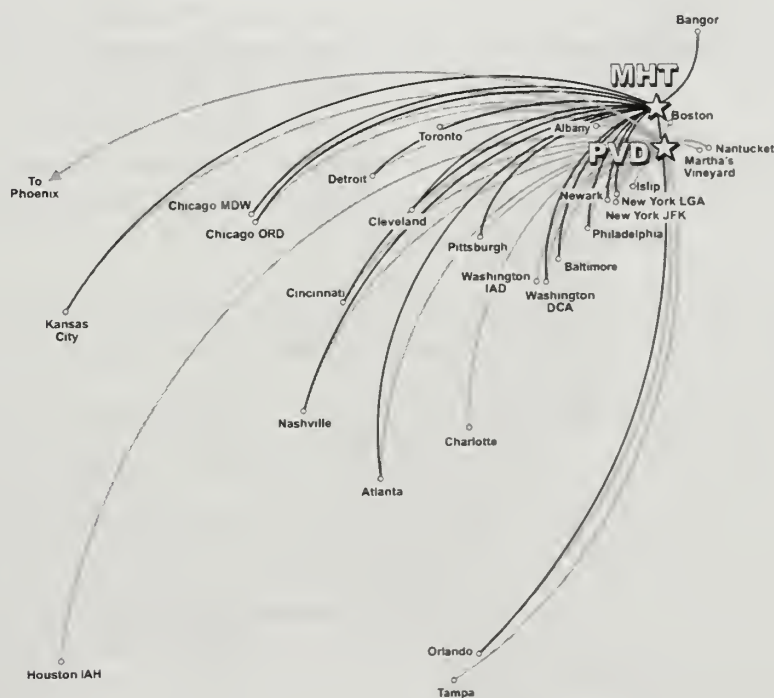
⁹ Both airlines initiated service in October 1996. Delta Express served the market for the entire month, while Southwest service commenced on October 27, 1996.

Southwest began its operation at T.F. Green/ Providence Airport with 14 daily, nonstop flights to several key business and leisure markets: Baltimore/Washington, Chicago Midway, Orlando, Tampa and Nashville. By December 1999, Southwest Airlines increased its overall services at T.F. Green/Providence to 23 daily, nonstop departures. In 2000, Southwest Airlines continued to expand its services and now provides 27 daily, nonstop departures from T.F. Green/Providence.

Also in October 1996, Delta Express, a low-fare subsidiary of Delta Air Lines, inaugurated low-fare jet services at T.F. Green/Providence, providing two daily, nonstop flights to Orlando and a daily, one-stop flight to West Palm Beach.¹⁰

Figure 2.2-8 (Cont'd)
Comparison of Nonstop Jet and Turboprop Markets Served from T.F. Green/
Providence and Manchester Airports– August 1995 and August 2000

August 2000 Service



10 Delta Express service between T.F. Green and West Palm Beach was subsequently discontinued.

Other significant service improvements at T.F. Green/Providence Airport are as follows:

- In June 1998, US Airways' low-fare service operation, MetroJet, entered the T.F. Green/Providence market with six daily nonstop flights to Baltimore, with connecting services to Florida destinations. By August 1998, MetroJet had increased its service to seven daily, nonstop departures from T.F. Green/Providence Airport.
- In 1998, Air Ontario, an Air Canada regional commuter carrier, began serving the Providence-Toronto, Ontario market with three, daily, roundtrip, non-jet commuter flights.
- In 1999, Continental Airlines began offering nonstop service to Houston. It also supplemented its nonstop Cleveland jet service with two daily roundtrip flights on regional jets. In 1999, Continental upgraded its nonstop services to Newark from turboprop to large jet aircraft.
- In 2000, Southwest Airlines added four daily nonstops services to Islip and one daily nonstop service to Phoenix.
- Also in 2000, Atlantic Coast, a regional partner with United Airlines, upgraded its service to Washington Dulles Airport from turboprop to regional jet aircraft.

The introduction of these services to the Providence market has been highly successful. Between 1996 and 1999, passenger traffic at T.F. Green/ Providence Airport increased by 2.7 million passengers. In 1997, the year after the beginning of Southwest Airlines and Delta Express services, the airport achieved 63.5 percent passenger growth, making it the fastest growing United States airport in 1997. In 1998, growth slowed to 13.7 percent, and in 1999, to 11.3 percent, but it is still well above the average growth rate for the New England region and the United States industry.

Over the last several years, the Rhode Island Airport Corporation (RIAC) and the FAA have made a number of capital investments at T.F. Green/Providence including:

- Construction of a \$207-million terminal building with seven additional aircraft gates, and addition of a dual level roadway and access road.
- Construction of two 1,500-space parking garages to accommodate the increase in automobile traffic.
- Construction of various taxiway and runway improvements, including a Category II Instrument Landing System (CAT II ILS), to accommodate the increase in aircraft traffic.
- Construction of a new Federal Inspection Services (FIS) facility.
- On-going residential and school sound insulation.

RIAC is about to embark on a new airport master plan for the T.F. Green/Providence Airport to address future airport needs. This will be, at least, a 2-year effort that will consider the feasibility of extending both runways.

2.2.4 Manchester Airport

In June 1998, Southwest Airlines continued its expansion into the New England market by inaugurating services at Manchester Airport in New Hampshire. The airline began serving Manchester with 12 daily, nonstop flights to key markets including Baltimore/Washington, Chicago Midway, Nashville and Orlando. By 1999, Southwest Airlines added one daily, nonstop flight to Kansas City, totaling 13 daily departures.

In June 1998, MetroJet also commenced services at Manchester Airport. MetroJet offered four daily, nonstop jet departures to Baltimore/Washington, with connecting services to Florida destinations. By August 1998, MetroJet increased its nonstop Baltimore service to five daily, nonstop flights.

Other key service improvements at Manchester Airport are as follows:

- In 1998, Northwest Airlines introduced three daily, nonstop jet flights to its Detroit connecting hub; by 2000, it increased its service to five daily flights during the peak travel months.
- In 1999, Continental Express inaugurated twice-daily, nonstop service to Cleveland with regional jet aircraft. In 2000, Continental upgraded its Manchester-Newark services from turboprop aircraft to large jet and regional jet aircraft.
- In February 2000, Delta Air Lines added two daily nonstop regional jet flights to its Atlanta hub. Later in the year, Delta upgraded the service to large jet aircraft.

Consistent with the experience at T.F. Green/Providence Airport, the introduction of these services at Manchester substantially increased passenger traffic. Between 1996 and 1999, passenger traffic increased by 1.6 million passengers. In 1998, traffic increased by 73.6 percent over the prior year, making Manchester the fastest growing airport in the United States. Extraordinary growth at Manchester continued in 1999, with passenger traffic increasing by 45.4 percent over the preceding year.

Since the early 1990s, significant capital investments at Manchester Airport have included:

- Construction of a 158,000-square-foot passenger terminal.
- Construction of a six-level parking garage with a capacity for 4,800 cars.

- Construction of a new airport entrance road.
- Construction of a 97,000-square-foot general aviation terminal.
- Reconstruction/extension/instrumentation of Runway 6/24 from 5,000 feet to 7,000 feet.
- Construction of a new United States Customs facility.
- Ongoing residential sound insulation.

Most of the FAA funds for the development of Manchester's new terminal in the 1990s were discretionary funds provided by the Military Airport Program (MAP). MAP is a special feature of the Airport Improvement Program (AIP) allocated to former military bases that can serve to complement congested airports such as Logan Airport. Manchester Airport expects to handle five to seven million annual passengers by 2005. In November 2000, the Manchester Airport Authority announced plans to seek \$121.5 million to fund additional airport development over the next five years. The plan calls for two terminal building additions, including a 70,000-square-foot addition, construction of a second parking garage, and roadway improvements. When completed in 2005, the project will have added eight additional aircraft gates. The second parking garage will be similar in size to the recently completed garage with more than 4,000 spaces. Recently the FAA announced approval of Manchester Airport's request for a Letter of Intent (LOI) of approximately \$60 million over the next seven years to reconstruct and extend Runway 17/35 from 7,000 feet to 9,000 feet.

On the air service side, airport management is instituting an aggressive marketing program to attract new airline services to Manchester Airport.

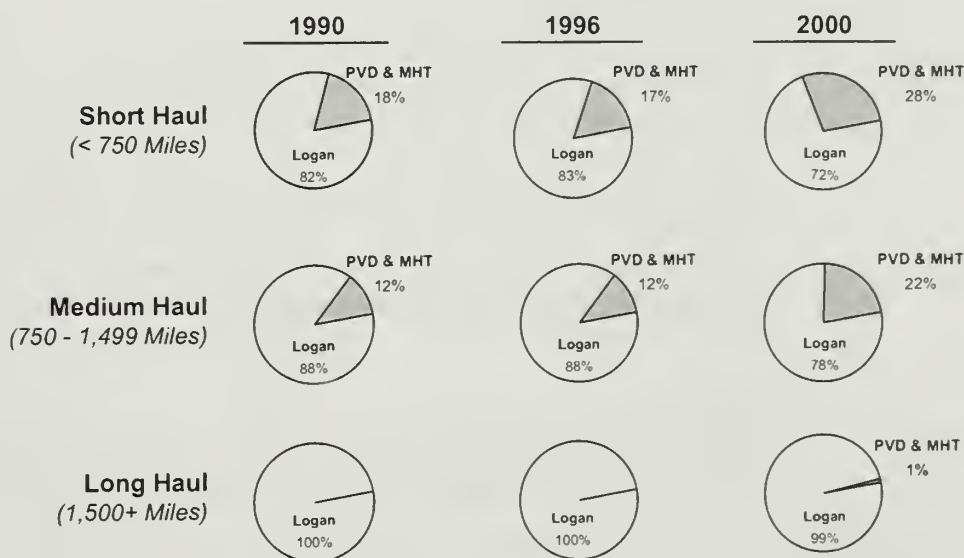
2.3 The Complementary Roles of Logan and the Regional Airports in a Regional Airport System

The recent airline service expansions at the T.F. Green/Providence and Manchester airports are significant accomplishments from a regional planning and development perspective. The expanded service offerings have created true airport options for air passengers, and have effectively expanded the roles of these airports in serving the region's air travel demand. These airports now have a critical mass of low-fare, direct services to popular short- (under 750 miles) and medium-haul (750 to 1,499 miles) destinations giving many passengers that originate north and south of I-495 an attractive option to Logan Airport.

The T.F. Green/Providence and Manchester Airports now offer a considerable portion of the available airline services in the region. In 2000, the Providence and Manchester Airports provided 28 percent of available seat capacity to short-haul markets. Earlier, in 1990 and 1996, Providence and Manchester were providing less than 20 percent of short-haul seat capacity (Figure 2.3-1). Similarly, their service share to medium-haul markets rose from 12 to 22 percent, but their share of long-haul capacity increased to just one percent.

Figure 2.3-1

Share of Nonstop Seat Capacity by Market Distance – T.F. Green/Providence and Manchester Compared to Logan Airport for 1990, 1996 and 2000



* Based on Daily Seats for August of Each Year.

Source: Official Airline Guide, August 1990, 1996 and 2000

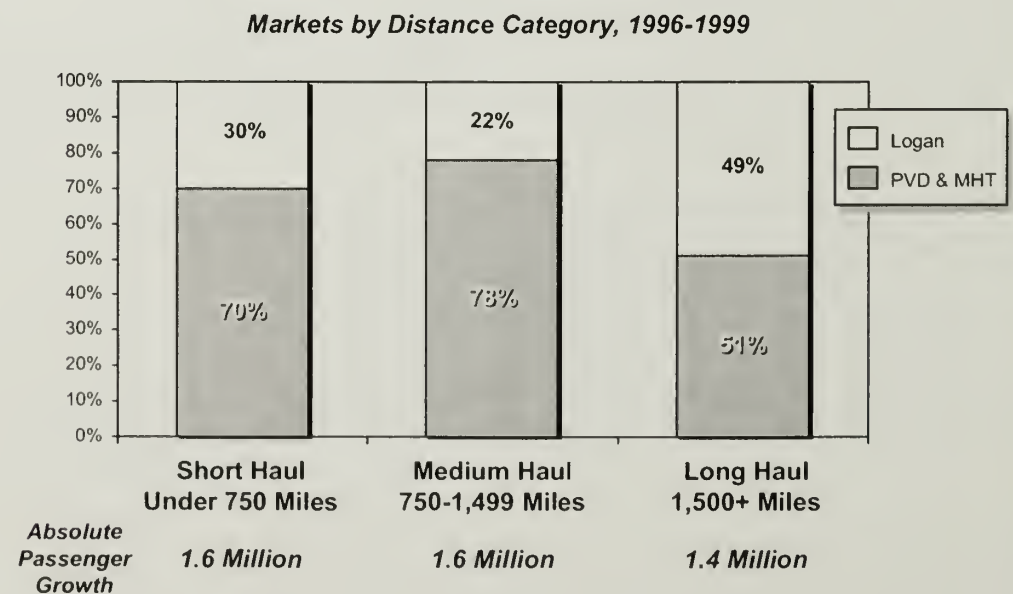
While the T.F. Green/Providence and Manchester Airports have increased their roles in the short- and medium-haul sectors, lower overall traffic densities within their respective market areas will prevent them from materially penetrating the thinner, long-haul market sector. Because of basic airline operating economics, Logan itself is served with fewer nonstop flights to long-haul markets, such as Los Angeles, compared to frequently traveled-to short-haul markets, such as New York. Hence, it is unlikely that the smaller, less-dense markets at T.F. Green/Providence, Manchester, and other regional airports could support a significant level of nonstop, long-haul services. Logan will remain the region's primary airport for reaching long-haul domestic and international destinations, while also serving the short- and medium-haul demand generated within its core market area (the area inside I-495).

By garnering a critical mass of services in the short- and medium-haul market segments, the T.F. Green/Providence and Manchester airports have been able to accommodate the majority of the region's passenger growth in these segments. From 1996 to 1999, short-haul demand generated by the three-airports increased by 2.3 million passengers. Seventy percent of this growth, or 1.6 million, new, short-haul passengers used the T.F. Green/Providence or Manchester Airports instead of Logan Airport (see Figure 2.3-2).

The substantial increase in medium-haul services at the two regional airports had a similar impact on airport usage. The three-airport system generated 2.0 million more medium-haul passengers, with the T.F. Green/Providence and Manchester Airports accommodating 78 percent of the increase, or more than 1.6 million passengers, as Figure 2.3-2 shows.

Figure 2.3-2

Share of Absolute O&D Passenger Growth in the Logan/T.F. Green/Providence/Manchester Airport System – By Market Distance Category, 1996 - 1999



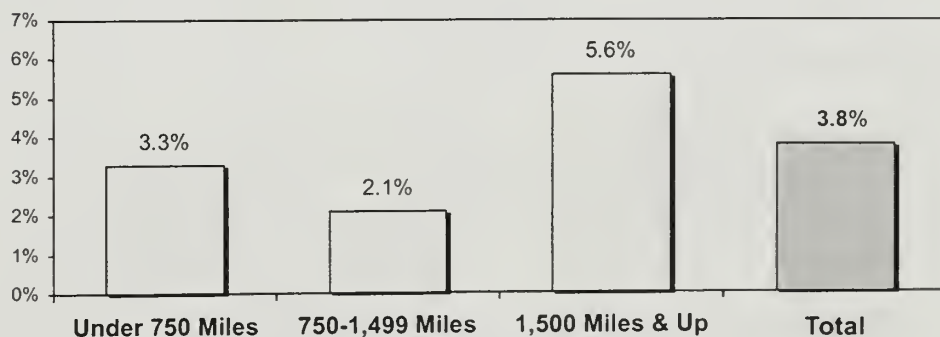
Source: USDOT, O&D Survey, and T-100.

The new traffic captured by the regional airports consists of untapped passenger demand stimulated by the introduction of low-fare services, passengers who shifted from ground modes to air because of the lower cost of air travel, and passengers who would have otherwise used Logan Airport, but switched to the regional airports because of new service offerings, competitive air fares and greater convenience.

Logan continues to be the primary airport for long-haul passengers (traveling to/from domestic and international markets), accommodating nine out of 11.2 million long-haul passengers generated by the three airports. From 1996 and 1999, the airport system generated 2.8 million additional long-haul passengers. Because Logan Airport leads the available services in this market segment, the regional airports attracted only half of this increase, or 1.4 million origin-destination (O&D) passengers, as Figure 2.3-2 shows.¹¹

Figure 2.3-3 shows recent growth trends at Logan Airport which confirm that the region's reliance on Logan for travel to short- and medium-haul destinations is declining. From 1996 to 1999, the number of Logan Airport passengers traveling to short- and medium-haul markets grew relatively slowly at average annual rates of 3.3 and 2.1 percent, respectively. The number of long-haul passengers using Logan Airport grew at a faster rate, increasing by 5.6 percent per year.

Figure 2.3-3
Logan Airport's Average Annual O&D Passenger Growth by
Trip Length to 1996 to 1999



Note: Includes reported domestic and international O&D passengers and estimated unreported foreign flag local passengers. Excludes connecting charter and GA passengers.

Source: US DOT, Origin-Destination Survey, and T-100.

▼
11 The majority of T.F. Green/Providence and Manchester passengers traveling to/from long-haul domestic and international markets require connecting service.

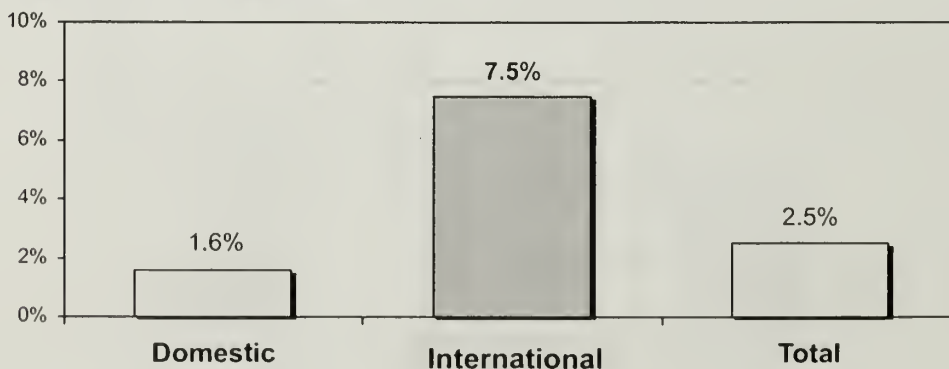
Figure 2.3-4 shows that Logan Airport's dominance in the long-haul sector is especially evident when examining its international traffic growth. From 1996 to 1999, the number of international passengers at Logan Airport increased almost five times as fast as domestic passengers. While total Logan Airport passengers increased by 2.5 percent per year during that period, international passengers grew at 7.5 percent per year and domestic passengers grew by just 1.6 percent per year.

Over time, long-haul traffic at Logan is expected to continue to grow faster than the short- and medium-haul market segments, solidifying its role in the regional airport system as the primary airport for long-haul travel.

Together, Logan and the regional airports will play essential roles in the emerging regional airport system. Logan Airport will remain the primary airport for passengers originating within I-495 and traveling to short-, medium- and long-haul destinations. The regional airports will play larger roles by functioning as the primary airports for short- and medium-haul demand that originates outside of I-495. Demographics, the distribution of demand within the region, and airline operating economics all dictate that Logan will continue to function as the region's primary airport for travel to long-haul domestic and international airports.

New England is well on its way towards achieving a true regional system of airports, but more can be done. Massport is working towards developing the Worcester Regional Airport to create a new airport option for passengers that originate in central Massachusetts and the western suburbs of Boston. The T.F. Green/Providence and Manchester Airports are engaged in development and planning efforts to ensure that they can continue to capture and accommodate passenger demand from their primary and expanded service areas.

Figure 2.3-4
Average Annual Passenger Growth at Logan Airport by
Type of Service – 1996 to 1999



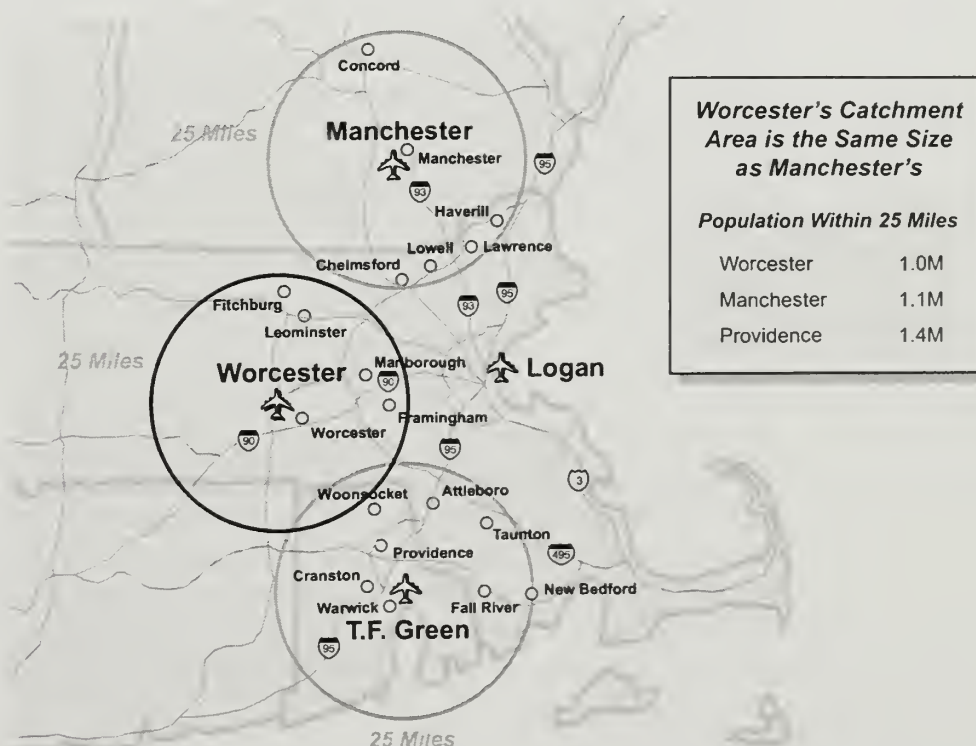
Source: Massport

The Pease Development Authority seeks to increase the role of the Pease International Tradeport in the regional transportation system and is aggressively marketing the facility to passenger and cargo airlines. Massport and the regional airports are undertaking cooperative marketing campaigns to increase passenger awareness of regional airport options to Logan. All of these efforts will move the region closer to the goal of a more efficient and balanced system of airports.

2.4 The Role of Worcester Regional Airport

T.F. Green/Providence and Manchester Airports are models of successful air service development that have contributed to the development of a regional system of airports in New England. Massport envisions the Worcester Regional Airport as the regional airport solution for air travel demand generated in central Massachusetts and the MetroWest suburbs. (see Figure 2.4-1).

Figure 2.4-1
Worcester Regional, T.F. Green/Providence, and Manchester Airports' Service Area and Location Relative to Logan Airport



2.4.1 Worcester Regional Airport Catchment Area

Worcester Regional Airport's natural catchment area is similarly sized to that of the Manchester Airport, which currently supports 50 daily jet departures to 15 destinations.¹² Each airport has a population base of about 1.0 million people residing within a 25-mile radius. For Worcester Regional Airport, this natural service area extends east to the Framingham/ Natick area, north to Fitchburg, west to Belchertown, and south beyond the Connecticut and Rhode Island borders.

Four competitive airports are within an approximate one-hour drive of Worcester Regional: Logan is 46 miles east, T.F. Green/Providence Airport is 41 miles south, Manchester Airport is 67 miles north, and Hartford/Bradley International Airport in Windsor Locks, Connecticut is about 71 miles southwest of Worcester Regional. Since these larger, well-served airports are within a reasonable driving range, the Worcester Regional Airport must attract a competitive level of services that includes frequent jet flights and attractive airfares to compete with these nearby airports.

2.4.2 Worcester Regional Airport Service Area Demand

The Worcester Regional Airport service area, defined by a 25-mile radius, generates about 2.1 million annual origin-destination passengers.¹³ This is an estimate of unconstrained demand, which essentially assumes equal access, service levels, and airfares for Worcester Regional and the surrounding airports. Since Logan Airport will continue to have a higher level of air services than Worcester, the Worcester Regional Airport will never capture 100 percent of its market area demand. However, in 1998, Worcester Regional Airport captured only three percent of its estimated passenger demand, indicating that the airport has substantial growth potential.

A survey conducted in 1999 of Worcester-area travel agencies and their airline ticket sales indicated that more than half of the demand generated within the Worcester Regional market area uses Logan Airport and almost one-third uses the T.F. Green/Providence Airport, as Figure 2.4-2 shows.¹⁴

The large portion of Worcester area passengers that uses Logan Airport indicates that service development at the Worcester Regional Airport would provide relief to Logan Airport. Similarly, the large portion of traffic using the T.F. Green/Providence Airport is an indication that T.F. Green/Providence is already providing relief to Logan Airport. Before the low-fare service expansion at T.F. Green/Providence, Logan Airport was capturing 80 percent of Worcester area passengers,¹⁵ thus T.F.Green/Providence is capturing Worcester-area passengers that were formerly using Logan Airport.

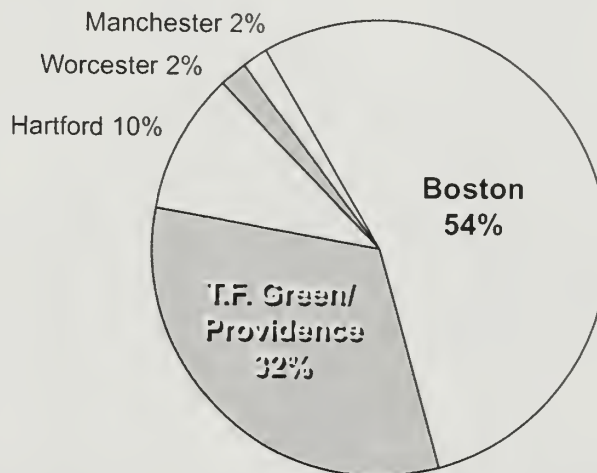
▼
12 Official Airline Guide, October 2000.

13 Based on previous estimates of Worcester's catchment area passenger demand as presented in the New England Regional Airports Air Passengers Service Study, 1995 by SH&E and the Passenger, Cargo, Economic Feasibility Study for Worcester Airport, 1995 by Sabre Decision Technologies.

14 Worcester Travel Agency Ticket-Lift Survey, conducted by SH&E, Inc. during summer 1999.

15 New England Regional Airports Air Passenger Service Study – Phase 2, Worcester Travel Agency Ticket-Lift Survey, 1996.

Figure 2.4-2
Worcester Area Passengers by Originating Airport - 1999 Travel Agency
Ticket Lift Survey



Source: Worcester Ticket Lift Survey, 1999

The Worcester Travel Agency Ticket Lift Survey also revealed airport usage patterns by destination (see Table 2.4-1). It showed that Logan Airport was the airport of choice for key, short-haul, business markets capturing 51 to 70 percent of area passengers traveling to Washington, Atlanta, New York and Philadelphia. Offering a minimum of hourly service to each of these destinations, the carriers operating at Logan Airport provide a distinct advantage over the services provided by carriers at other airports.

Passengers traveling to markets with a lack of direct flights from the regional airports, such as Tampa, Ft. Myers, Dallas/Ft. Worth and St. Louis, most often used Logan Airport. T.F. Green/Providence attracted high shares of passengers (48 to 77 percent) in several markets, particularly destinations served with nonstop or multiple-stop flights on Southwest Airlines: Orlando, Chicago, Los Angeles, Detroit, Phoenix, and Baltimore.

Table 2.4-1
Airport Usage Patterns by Destination for Worcester-Area Passengers- 1998/1999

Rank	Market	BOS	PVD	BDL	MHT	ORH	Total
1	Orlando	31.9%	47.5%	18.9%	1.3%	0.5%	100.0%
2	Chicago	42.7%	48.8%	3.7%	4.0%	0.8%	100.0%
3	New York	64.4%	23.0%	2.1%	1.8%	8.7%	100.0%
4	Atlanta	63.1%	13.5%	20.4%	1.3%	1.7%	100.0%
5	Detroit	29.2%	59.0%	7.9%	3.4%	0.5%	100.0%
6	Tampa	49.5%	28.4%	17.4%	2.2%	2.6%	100.0%
7	Washington	51.2%	23.8%	3.7%	0.5%	20.8%	100.0%
8	Fort Lauderdale	39.4%	18.7%	40.2%	0.1%	1.6%	100.0%
9	Fort Myers	58.6%	23.2%	15.3%	1.8%	1.2%	100.0%
10	Phoenix	31.0%	64.5%	2.3%	1.9%	0.3%	100.0%
11	Los Angeles	36.9%	58.4%	3.7%	1.1%	0.0%	100.0%
12	Philadelphia	70.0%	13.8%	3.9%	1.3%	11.0%	100.0%
13	Baltimore	11.0%	76.5%	2.6%	7.9%	2.0%	100.0%
14	Dallas/Fort Worth	64.8%	13.5%	19.4%	1.0%	1.3%	100.0%
15	St Louis	73.4%	23.1%	3.1%	0.4%	0.0%	100.0%
Subtotal		46.2%	36.8%	11.7%	2.0%	3.3%	100.0%
All Other		60.8%	27.6%	7.4%	2.5%	1.8%	100.0%
Total		53.5%	32.2%	9.6%	2.3%	2.5%	100.0%

Source: Worcester Travel Agency Ticket Lift Survey, 1999.

Note: Shaded box indicates the airport with the highest market share.

BOS = Logan PVD = T.F. Green BDL = Bradley MHT = Manchester ORH = Worcester

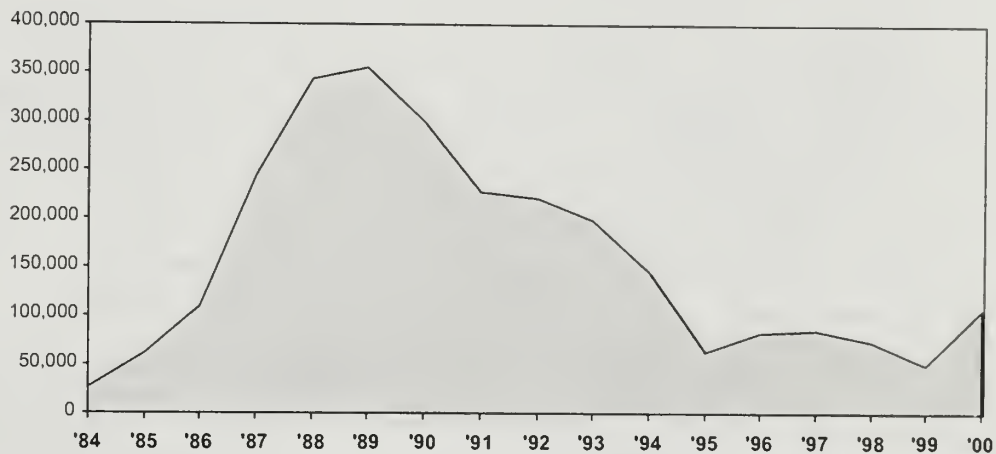
2.4.3 Worcester Regional Airport Air Traffic and Service Trends

Worcester Regional Airport has accommodated scheduled passenger service since the late 1940s.¹⁶ However, these services were limited and passenger traffic grew only modestly. After reaching 90,000 passengers (enplaned and deplaned) in 1957, passenger levels declined until 1986. In that year, Worcester Regional Airport experienced brief unprecedented growth. Airport passenger traffic increased sharply from 58,000 in 1985 to a peak of 355,000 in 1989, as Figure 2.4-3 shows.

Between 1986 and 1989, Worcester Regional enjoyed exceptionally strong air traffic growth. This was a period of rapid growth in the local and national economies and of major expansion within the airline industry. In 1989, Worcester Regional received daily jet services to Baltimore, Newark, Detroit, and Pittsburgh.

▼
 16 Construction of the Worcester Airport was completed in 1948.

Figure 2.4-3
Worcester Airport Passenger Enplanements – Calendar Year 1984 to 2000



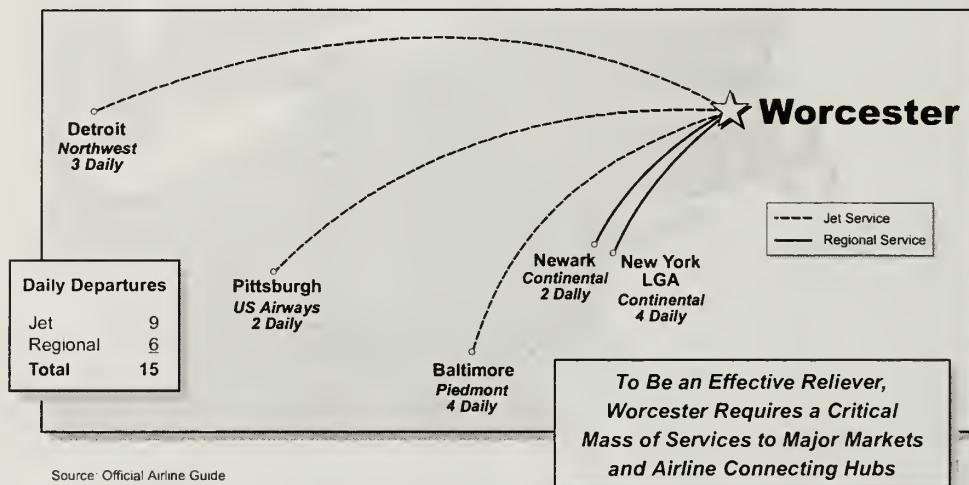
Source: USDOT, Form 41 - Schedule T3 and Part 298/C, and Airport Records.

Worcester Regional Airport's passenger traffic began to decline again in 1990, the same year that the Massachusetts economy entered a difficult recession. Massachusetts was particularly hard hit because the local economy was heavily tied to the defense and mainframe computer industries, which were also declining. At the same time, the airline industry was consolidating, which, coupled with slower economic growth and weakened air travel demand, led to severe financial losses. As airlines tried to rationalize their merged networks and stem financial losses, they withdrew services from many small communities like Worcester. Worcester itself was impacted by the 1990 merger of US Airways (then USAir) and Piedmont Airlines.

In 1993, the New England economy entered another period of prosperity, but passenger traffic at Worcester Regional Airport did not rebound to previous levels as other regional airports did. In 1999, 50,000 commercial airline passengers used Worcester Regional Airport, compared to its peak of 355,000 passengers in 1989. After aggressive marketing efforts by Massport, traffic at the Worcester Regional Airport more than doubled to 106,000 passengers in 2000.

As Figure 2.4-4 shows, in its peak year, Worcester Regional Airport was served with 15 daily departures to nine destinations, nine on jet aircraft and six on turboprops. In 1989, Worcester Regional received scheduled passenger services from Piedmont (now US Airways), US Airways, Continental and Northwest Airlines. The airport had nonstop services to New York LaGuardia, Newark, Baltimore, Pittsburgh and Detroit. Worcester Regional Airport's peak level of service, however, proved to be insufficient to attract the necessary levels of passenger traffic to relieve growth pressures at Logan Airport or to establish Worcester Regional as a viable air service market. The resulting effects of this were the withdrawal of carriers from the market and the decline of traffic.

Figure 2.4-4
Worcester Regional Airport Nonstop Service - August 1989



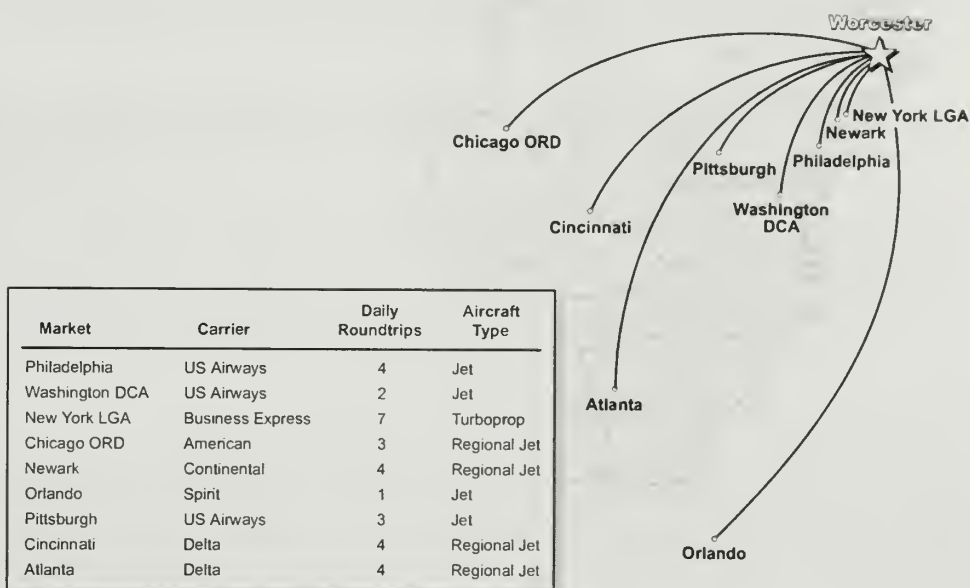
As of August 2000, the Worcester Regional Airport was served by three commercial passenger airlines. US Airways Express provides four daily, nonstop turboprop flights to Philadelphia. Atlantic Southeast Airlines, a Delta Connection carrier, provides two daily, nonstop regional jet flights to Delta Air Lines' Atlanta hub. Finally, American Eagle flies three times a day to New York JFK International with turboprop aircraft. In February 2001, Pan Am initiated nonstop service between Worcester and Orlando Sanford International Airport. In April 2001, Delta Connection will increase its service to Atlanta to three daily roundtrips.

In addition to general industry and economic conditions, facility, equipment, and ground access constraints also contributed to Worcester Regional Airport's decline and slow recovery. The sections below explore these constraints.

2.4.4 Worcester Regional Airport Service Feasibility

Worcester Regional Airport's past experience and the recent successes at T.F. Green/Providence and Manchester airports demonstrate that, to be an effective reliever in the regional airport system, the Worcester Regional Airport requires a critical mass of competitively priced services to key connecting hubs and major destinations. To assess Worcester Regional Airport's potential in serving the central Massachusetts and MetroWest passenger demand, the feasibility of potential Worcester Regional Airport air-service routes was analyzed. The carrier routes selected for feasibility analysis were based on existing air service patterns at the T.F. Green/Providence, Manchester, and Portland, Maine airports. Based on the same planning models and methodologies that airlines use to assess competitive market shares in a multi-airport environment, several jet, regional jet and turboprop routes were found to be feasible (see Figure 2.4-5). The analysis assumed convenient ground access to Worcester Regional Airport.

Figure 2.4-5
Candidate Worcester Regional Air Service Routes



Candidate air service routes from Worcester Regional Airport would include service to short-haul, high density, business markets such as Washington Reagan National and New York LaGuardia; service to major airline connecting hubs such as Atlanta, Philadelphia, Pittsburgh, Chicago O'Hare, Newark, and Cincinnati; and low-fare service to leisure markets, such as Orlando. If just four to five of these candidate air-service routes were in place in 2010, Worcester Regional could achieve 600,000 to 800,000 passengers per year, depending upon the exact routes. At this level of activity, Worcester Regional Airport could potentially recapture about 300,000 to 400,000 passengers that otherwise would use Logan Airport.

2.4.5 Worcester Regional Airport's Ability to Attract Air Service

Several factors influence the ability of a regional airport, like Worcester Regional, to attract and sustain airline services. These include:

- The size of the airport's catchment area and the associated demand for air travel
- The proximity of alternative airports
- The availability of airside facilities
- Effective marketing efforts to attract both airlines and passengers
- Adequate ground access to the airport

In nearly all of these measures, Worcester is a favorable air service market. The market area of the Worcester Regional Airport is sizeable and generates approximately 2.1 million annual O&D passengers. However, because of its proximity to alternative airports, the Worcester Regional Airport requires a critical mass of air services in order to attract passengers from its substantial market area.

Massport, with the aid of an air service marketing consultant, is engaged in an aggressive marketing campaign to attract new airlines and passenger services to the Worcester Regional Airport. On January 15, 2000, Massport assumed actual operating responsibility for Worcester Regional Airport with the goal of developing a more efficient regional transportation network by increasing the airport's utilization. Massport has presented air service proposals to several airlines including Spirit Airlines, Jet Blue, American Trans Air, American Airlines, Delta Air Lines, Continental Airlines, Shuttle America, and Pan Am. Massport will continue these efforts, which have already resulted in several new services at Worcester:

- In February 2000, Atlantic Southeast Airlines (Delta Connection), a regional carrier subsidiary of Delta Air Lines, began serving Worcester Regional Airport market with two daily flights to Atlanta, with 50-seat Canadair Regional Jets. This service has been so successful, with passenger load factors reaching 94 percent in August, that Delta Connection is adding a third daily roundtrip in April 2001.
- In July 2000, American Eagle initiated nonstop flights to New York JFK International Airport. The service is operated three times per day, with 34-seat Saab 340 turboprops.
- On February 6, 2001, Pan Am began nonstop service from Worcester to the Orlando Sanford International Airport. This service operates once a day with Boeing 727 jet aircraft.

The FAA and the City of Worcester have invested \$33 million in airside and landside improvements to upgrade the Worcester facility. In the mid 1990s, a \$15.7-million passenger terminal was constructed and more than \$8 million was invested in navigational equipment and airfield improvements to enhance the Airport's operational reliability.

As part of a regional transportation project, the Massachusetts Highway Department (MassHighway) is working to improve road access to the Worcester Regional Airport. A number of ground access routes that will improve access in the city and provide a connection between the airport and the inter-state highway system are being evaluated by MassHighway. A surface route would not only reduce congestion on major thoroughfares in the city and improve access to several western suburbs, it would also provide a safe, direct route from the Massachusetts Turnpike (I-90) and I-290 to Worcester Regional Airport. MassHighway submitted an ENF on the access road options to EOEa and received a Certificate from the Secretary on February 11, 2000. A combined Draft EIS/EIR is expected to be filed in October 2001. If approved, construction of a new road is expected to begin in 2004 and be completed by 2007.

The Worcester Airport is an example of how Massport is actively involved in promoting a regional airport system and the extent to which coordination with federal, state and local agencies can effectively promote and improve transportation options in the region.

2.5 Impact of Regional Alternatives on Logan Airport Demand

Despite the strength of the local and national economies, Logan's passenger traffic has grown more slowly than the United States average and the New England region for several years. The slower growth observed at Logan Airport coincides with extraordinary growth at neighboring regional airports.

The regional airports, particularly T.F. Green/ Providence and Manchester, have become attractive options for many former Logan Airport users because of their proximity to the Boston metro area, lack of congestion, improved air service offerings, and low airfares. These airports will continue to dampen future growth at Logan by capturing a greater portion of the region's growth in air travel demand, particularly in the short- and medium-haul travel sectors.

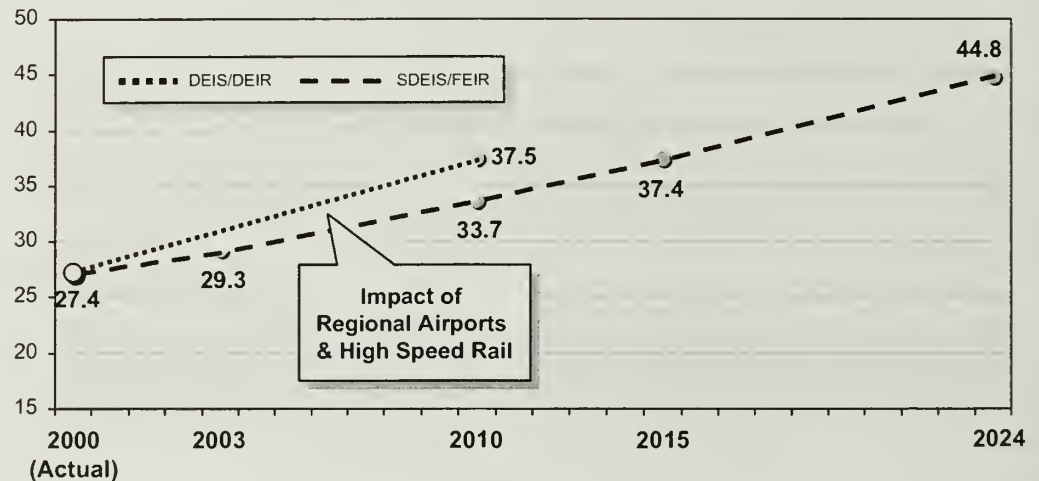
Also, many of the inter-city rail projects, which were discussed in the Airside Project Draft EIS/EIR, are closer to implementation. These projects, which include Amtrak's high-speed Acela service between Boston's South Station and New York's Penn Station, should also divert passengers from Logan Airport and reduce Logan's future passenger growth.

The increased role of regional airports and improved inter-city rail will continue to diminish passenger growth at Logan Airport. Based on this assumption, Massport has lowered its passenger growth projections. If growth continues at the slower rate observed over the last several years, Logan is expected to reach 34 million passengers in 2010 and will not achieve 37.5 million passengers until 2015 (Figure 2.5-1). This revised passenger forecast, which assumes that regionalization continues, is carried through the operational and environmental analyses in Chapters 4 and 6.

The operational analysis indicates that the proposed Airside Project improvements at Logan are necessary even with increased regional transportation options and significant passenger diversion from Logan to the regional airports and rail. While the expansion of regional transportation options will play an important role in reducing future demand for Logan Airport, it will not reduce passenger demand generated within Logan's core market area or the long-haul domestic and international travel demand of the broader region. The proposed Airside Project improvements, particularly the construction of Runway 14/32, are needed to improve the reliability, efficiency and safety of current and future operations at Logan. Runway 14/32 is the only measure that will correct the

existing limitation in Logan's airfield layout that causes excessive, yet avoidable, delays during northwest wind conditions.

Figure 2.5-1
Logan Airport Passenger Forecasts: Impact of Regional Transportation Options



2.6 Role of Other New England Commercial Airports

In addition to Logan, T.F. Green/Providence, Manchester, and Worcester Regional Airports, several other airports serve the New England region. These airports which are depicted in Figure 2.2-4, and described below, primarily serve areas outside the Boston Metropolitan Service Area in northern and southwestern New England. Because of their distance from Logan's core service area, the potential role that these airports can play in diverting demand from Logan is limited.

2.6.1 Hartford/Bradley International Airport, Hartford, Connecticut

The Hartford/Bradley International Airport is the second largest airport in New England after Logan Airport. Located in northern Connecticut, its primary function is to serve air passenger demand that originates in the southwest region of New England. Because of its distance from Boston and its proximity to New York, the Hartford airport primarily serves passengers that would otherwise use New York City airports, and has no potential to divert passengers from Logan Airport.

In October 1999, Hartford/Bradley International Airport became the third New England airport to receive Southwest Airlines' low-fare jet services. As of October 2000,

Southwest Airlines provides 13 daily departures from Hartford to Baltimore, Chicago Midway, Nashville and Orlando. Also in 1999, America West, another low-fare jet airline entered the Hartford market. America West provides one daily jet flight to Las Vegas, one daily jet flight to Phoenix, and three daily jet flights to Columbus, Ohio.

Over the last year, other carriers have also expanded services at Hartford. Delta Air Lines added one daily jet flight to New York JFK International; Midway Airlines added an additional flight to Raleigh/Durham; Continental Airlines upgraded its Newark flight to a larger aircraft; and US Airways upgraded its services to Baltimore from US Airways Express turboprops to MetroJet jet services.

Recent facility improvements at Hartford/Bradley International include renovations to Terminal B, the construction of a new FAA Tower, and a new firehouse.

2.6.2 Portland International Jetport, Maine

The Portland International Jetport, in Portland, Maine primarily serves the southern Maine area. The 1995 *New England Airports Air Passenger Study* concluded that the Portland Airport had only a minimal ability to attract passengers that originate in Logan Airport's outer market area. However, Portland has historically relied on air services to Logan for connecting flights to destinations outside of New England. Thus, expanding air services at Portland can provide relief to Logan Airport by reducing the need for air services between Portland and Boston, which are often operated with small commuter aircraft. The economic feasibility of additional direct services from Portland will be analyzed in the upcoming *New England Airports System Study* (see Section 2.9.1, Table 2.9-3 and Appendix B for a description of the study and the proposed work scope).

In 1999, there was a decline in scheduled airline services at the Portland International Jetport compared to 1998. In terms of jet service reductions, Continental Airlines eliminated its daily nonstop service to Newark, United Airlines reduced its nonstop jet services to Chicago O'Hare from three daily roundtrips to 2, United discontinued one daily roundtrip to Washington Dulles, and US Airways reduced its Philadelphia service by one daily roundtrip. Among the regional carriers, both Business Express (now American Eagle) and US Airways Express reduced services to Boston and New York LaGuardia.

Since 1999, the Portland International Jetport benefited from several airline service additions. Continental Airlines added two daily, nonstop jet departures to its Cleveland connecting hub. Northwest Airlines increased jet services between Portland and its Detroit connecting hub. US Airways added an additional daily jet flight to Philadelphia and a new nonstop regional jet flight to Washington Reagan National. These additional flights at Portland reduce the need for Portland passengers to fly to Logan Airport for connecting services. In fact, in 2000 American Eagle (formerly Business Express) reduced its turboprop services between Portland and Boston by three daily roundtrip flights.

Capital investment projects for the Portland International Jetport include a new roadway system, a 50,000-square-foot terminal with two new gates and a ramp addition, and improvements to the Maine Turnpike-Jetport interchange.

2.6.3 Bangor International Airport, Maine

The Bangor International Airport, in Bangor, Maine, is even more distant from Logan Airport and the Boston market area than the Portland International Jetport, so it plays no role in relieving local passenger demand for Logan Airport. Because of its distance from Boston and its comparatively small population base, Bangor is even more reliant than Portland on air services to Logan Airport for connections to national and international destinations. Thus, improving air services at Bangor can reduce the need for direct air services to Logan Airport. The economic feasibility of these types of services will be analyzed in the upcoming *New England Airports System Study* (see Section 2.9.1, Table 2.9-3 and Appendix B for a description of the study and the proposed work scope).

In 1999, Delta Air Lines withdrew its mainline jet services at Bangor International Airport and replaced them with Delta Connection regional jets, operated by Comair, to Cincinnati. The change in Delta's service pattern eliminated single plane services from Bangor to Delta Air Lines's Atlanta hub and replaced two daily onstop departures to Cincinnati on large jets with four daily nonstops on regional jets. Other service changes included reductions in Continental Express services to Newark and US Airways Express services to Boston. Business Express added two daily nonstops to New York LaGuardia on non-jet aircraft.

In 2000, overall airline services increased slightly at the Bangor International Airport. Pan Am entered the Bangor market with nonstop services to Pittsburgh and Portsmouth, NH (Pease International). However, Bangor Airport lost several of its direct services to the New York/Newark area. Continental Express withdrew its two daily, turboprop flights to Newark and American Eagle discontinued two of its daily, nonstop, turboprop flights to New York LaGuardia. To compensate for these service reductions, US Airways Express added a nonstop flight to Portland with continuing single-plane service to New York LaGuardia; four daily, nonstop flights to Boston; and two daily, nonstop flights to Philadelphia.

Several facility improvements have been made at Bangor International Airport over the last several years. These improvements include taxiway improvements, the expansion of the commuter airline parking apron, the addition of enclosed passenger walkways, the rehabilitation of terminal and general aviation aprons, and the construction of a general aviation hanger. Over the next couple of years, the runway at Bangor International Airport will undergo major renovations to renew the life of the runway pavement.

2.6.4 Burlington International Airport, Vermont

Burlington International Airport is another distant airport that primarily serves air passenger demand originating in Vermont. Like other northern New England airports, it relies on air services to Logan Airport for connecting flights. To the extent that Burlington can attract more direct services to short-haul high density markets and airline connecting hubs, its reliance on air services to Logan will diminish. The economic feasibility of these types of services will be analyzed in the upcoming *New England Airports System Study* (see Section 2.9.1 and Appendix B for a description of the study and the proposed work scope).

In 1999, the Burlington Airport benefited from several service upgrades. US Airways replaced a non-jet service to New York LaGuardia with a regional jet service. Similarly, United Express replaced a non-jet flight to Washington Dulles with a regional jet. Continental Express initiated new nonstop regional jet service to Continental's Cleveland connecting complex.

In 2000, Burlington International Airport gained many new air services. JetBlue, the nation's newest low-fare jet carrier, entered the Burlington market with two daily, nonstop flights to its New York JFK hub. JetBlue, which former Southwest Airlines executives operate, is rapidly expanding its operations at JFK, offering connecting services to destinations throughout the country. Continental Express expanded its operation at Burlington International Airport by supplementing its turboprop services with regional jet flights to its Newark and Cleveland hubs. United Express upgraded its Washington Dulles services from turboprops to regional jets. Similarly, US Airways Express upgraded one of its flights to Washington Reagan National from a turboprop aircraft to a regional jet.

Several significant capital improvements to Burlington International Airport are in various stages of construction. A 17,000-square-foot expansion to the terminal building is under construction. Other projects include the addition of a commuter ramp extension to accommodate regional jets, and construction of a 40,000-square-foot maintenance hanger and a three-level parking garage.

2.6.5 Tweed-New Haven Airport, Connecticut

Located in southern Connecticut, the Tweed-New Haven Airport has no impact on Logan Airport. It is not close enough to Logan's core market area to provide any passenger relief and there are no scheduled services between New Haven and Logan Airport. Its service area largely overlaps with the Hartford/Bradley Airport service area.

In 1999 and 2000, the airline services offered from the Tweed-New Haven Airport have remained unchanged. The airport continues to receive eight daily, nonstop departures from US Airways Express. Five flights link New Haven to US Airways' Philadelphia hub and three nonstop flights are operated to Washington Reagan National.

The Tweed-New Haven Airport is currently conducting a Master Plan Study. In terms of capital improvements, an existing building has been modernized to serve as a new terminal.

2.6.6 Other New England Commercial Passenger Airports

In addition to New England's principal, commercial service airports, described above, there is another tier of airports that serve isolated communities or provide niche-commercial airline services. (Figure 2.6-1)

Several of these airports serve very small, remote communities that can only support services to Logan Airport. For these communities air service to Logan Airport is their sole access to the national air transportation network and destinations beyond Boston. These airports include Augusta, Presque Isle and Rockland, all in Maine. Other airports, such as Hyannis, Nantucket and Martha's Vineyard, serve higher-demand markets with services to Logan Airport and other major Northeast airports during the peak travel season. New Bedford, MA¹⁷ and Westerly, RI, are only served with air-taxi operations to/from island markets (Nantucket, Martha's Vineyard and Block Island). Hanscom Field and Pease International did not receive scheduled passenger services until 1999. Both airports are now served with scheduled niche scheduled commercial airline passenger services.

Most of these airports are very remote from the core Logan service area and have limited market areas. Consequently, they are unable to support a sufficient level of air services to attract passengers that now use Logan Airport, and play virtually no role in relieving Logan Airport. Since Hanscom Field is part of Massport's proprietary airport system, it is somewhat of an exception and deserves further discussion. Because of the proximity of Pease International Tradeport, it also deserves further focus.

2.6.7 Hanscom Field

Hanscom Field, which Massport owns and operates, plays an important role in the regional transportation system as a general aviation reliever to Logan Airport with niche commercial passenger service. Hanscom Field accommodates a variety of general aviation operations, including private, business, charter and air taxi operations that might otherwise use Logan Airport.



¹⁷ Environmental analysis for the potential lengthening of the runway at New Bedford to accommodate integrated cargo services, as well as regional jet services, is currently underway. A Draft EIS/EIR is expected to be filed with MEPA and FAA/NEPA by the end of 2001.

Figure 2.6-1
Other New England Airports Receiving Commercial Air Passenger Service



Source: Official Airline Guide

In 1999, there were 197,302 general aviation operations at Hanscom Field, an increase of 7.7 percent over 1998 activity. Hanscom Field accommodated more than five times the number of general aviation operations that occurred at Logan Airport, which accommodated 38,000. Approximately 45 percent of Hanscom Field's operations were conducted with single-engine, piston aircraft. Training operations, which consist primarily of practice take-offs and landings by flight school students and staff, represented over 37 percent of Hanscom Field's operations. Business jets, twin-engine turboprop aircraft, helicopters, and military aircraft accounted for the remainder of the activity.

Even when its training activity is excluded, Hanscom Field handles more than three times the number of general aviation operations that occur at Logan Airport. Moreover, there are about 400 general aviation aircraft based at Hanscom Field, while there are none based at Logan Airport. For many general aviation users, Hanscom Field is a more attractive facility than Logan Airport because it has lower user fees and less restrictive airspace. Massport does not require general aviation users to pay a landing fee at Hanscom Field,¹⁸ whereas Logan Airport users are required to pay a landing fee. These factors divert many operations from Logan Airport to Hanscom Field each year, as the substantially higher volume of general aviation activity at Hanscom Field indicates.

In September 1999, Shuttle America, a new entrant regional/commuter airline began scheduled commercial passenger service from Hanscom Field to Trenton/Philadelphia and Buffalo (one stop via Trenton) with four daily, roundtrip flights on 50-seat Dash-8 turboprop aircraft. In 1999, Hanscom Field accommodated 22,924 Shuttle America passengers and 1,164 Shuttle America aircraft operations. In 2000, the first full year of Shuttle America's Hanscom services, there were 162,147 scheduled service passengers and 6,572 scheduled operations at Hanscom Field. In October 2000, Shuttle America scheduled four daily, nonstop flights to Buffalo and seven to Trenton/Philadelphia. On November 1, 2000, Shuttle America began serving the Hanscom Field-LaGuardia market with five daily roundtrip flights and increased its Hanscom-LaGuardia service from five to seven daily roundtrips in February 2001.

Because the service areas of Logan, Manchester and Worcester Regional Airports envelope Hanscom Field's service area and there has been rapid low-fare service development at Manchester Airport, Hanscom Field will continue to be a general aviation reliever for Logan Airport, while offering niche commercial airline flights, such as the Shuttle America services.

2.6.8 Pease International Tradeport

In 1991, the federal government transferred operational authority for the Pease Air Force Base in Portsmouth, New Hampshire to the Pease Development Authority (PDA). Since assuming control over the former military base, the PDA has worked to develop the facility into an international aviation hub. A new, 20,000-square foot passenger terminal with a Federal Inspection Service facility and a Federal Trade Zone designation was built at the Pease International Tradeport. In addition to the terminal, the FAA has provided funds to rehabilitate the taxiway and apron, as well as upgrade/add the runway ILS and approach lighting systems. Like Manchester Airport, Pease has received, and continues to receive, MAP funds, which are allocated to former military bases that can serve to complement congested airports, such as Logan.



18 Hanscom Field operations that occur between 11:00 PM and 7:00 AM are assessed a nighttime surcharge of \$42.00 for aircraft under 12,500 lbs. and \$306 for aircraft over 12,500 lbs. For operators with more than 5 violations (on arrival or departure) in a single year, the nighttime surcharge is doubled starting with the sixth violation.

The PDA is marketing the airport, which has an 11,300-foot runway in addition to its new passenger terminal and FIS facility, to large air carriers. With these new facilities, the Pease International Tradeport is potentially an attractive market for charter operators and cargo airlines. The potential long-term role of Pease International Tradeport will be evaluated in the *New England Airports System Study* (see Section 2.9.1).

In 1998, Pan American Airlines signed a long-term lease with the PDA, and, in 1999, it initiated scheduled and charter passenger service from the airport. Pan Am currently provides nonstop jet service to Orlando Sanford International Airport and Gary, Indiana. Emery Worldwide, an all-cargo airline, also serves Pease International Tradeport with one daily Boeing 727 freighter to Emery's Dayton, Ohio cargo hub. In addition to aviation uses, there has been tremendous growth in other land uses on the former military base which have contributed to the local economy.

2.6.9 General Aviation Reliever Airports

In addition to New England's regional commercial service airports there is another tier of airports that supports the general aviation component of the system. The role of these general aviation airports is appropriately identified in FAA's National Plan of Integrated Airport Systems (NPIAS) as "Reliever" airports. General aviation reliever airports typically are located and developed to attract the general aviation activity that would otherwise be active at a nearby congested airport. The Boston regional system has five such airports: Hanscom Field in Bedford, MA; Norwood Memorial in Norwood, MA; Beverly Municipal in Beverly, MA; Lawrence Municipal in Lawrence, MA ; and Boire Field, in Nashua, NH. Almost 1,000 aircraft are based at these airports and they accommodate about 750,000 operations annually. Runway lengths at these airports range in length from 4,000 feet to 7,000 feet, and except for Nashua, all have crosswind runways. They also have instrument capabilities to service non-precision or precision approaches. This reliever general aviation system receives priority consideration when FAA considers federal funding for capital improvement projects. Although no major improvements are planned for these facilities, there are on-going projects to maintain safe operations.

2.7 Other High-Speed Intercity Travel Options

2.7.1 Rail Service

In addition to the regional airports, several rail projects in the New England area will increase options for inter-city travel and create a more efficient and environmentally balanced regional transportation system. Table 2.7-1 provides the status of each of these projects and their potential impact on reducing air travel out of Logan Airport.

Table 2.7-1
Regional Rail Projects with Air Diversion Potential from Logan Airport

Project	Lead Agency	Description	Status	Projected Completion	Estimated 2010 Air Diversion
Northeast Corridor High Speed Rail	Amtrak	Reduce Boston to New York City rail travel times to four hours for Acela Regional Service and about three hours for Acela Express.	Completed	Acela Regional started January 2000 Acela Express started December 2000	1,220,000 ¹
Portland-Boston Amtrak Service	Amtrak	Reinstate Portland, ME/Southern New Hampshire/ Boston North Station service using existing rail lines.	Completed	Service to begin in 2001	133,000 ²
Warwick/T.F. Green/ Providence Intermodal Station	Rhode Island DOT	Amtrak/Commuter Rail service from Boston South Station to Warwick Station with People Mover Connection to T.F. Green/ Providence Airport.	EA approved by FHWA in July 1999.	Construction to begin by late 2001.	128,000 ³
North Station-South Station Rail Link	MBTA	Construction of a rail tunnel to link North Station and South Station in Boston. ⁴	Under environmental study	—	—
TOTAL					Up to 1,481,000

1 Latest publicly available data. Appendix B provides Amtrak's reply to request for updated numbers.

2 Interpolated from estimated 2015 diversion of 200,000 passengers annually.

3 Interpolated from 2000 and 2020 ridership estimates assuming 67 percent are non-airport employees (based on Survey of Warwick Intermodal Station at T.F. Green/Providence Airport Warwick, Rhode Island, May 1, 1999).

4 North-South Rail Link is not expected to be operational until after 2020.

Northeast Corridor High-Speed Rail

Of all rail projects, Amtrak's high-speed, Boston-New York Acela service offers the greatest potential for reducing Logan Airport's air travel demand in the Boston-New York corridor. By reducing the travel time between downtown Boston and downtown New York to about three hours, the Acela service will be an attractive alternative to the Boston-New York air shuttles for business passengers.¹⁹ This will provide relief to Logan Airport by accommodating up to 1.2 million Logan passengers or one-third of the estimated future air-travel demand in Logan Airport's largest origin-destination market, the Boston-New York market. For more information on Northeast Corridor Amtrak Service see Sections 2.4.2.2 and 2.4.2.5 of the Airside Project Draft EIS/EIR.

19 While Acela service is an attractive option for Boston-New York air passengers, it is not competitive with air travel in the Boston-Washington market due to its longer distance (470 miles versus 250 miles for the Boston-New York City train) and uncompetitive travel time (6 hours, 30 minutes for Acela versus one hour, 40 minutes for air travel).

Boston-Portland, Maine Rail Service

In 2001, rail service between Boston and Portland, Maine will be restored. The service, called the "Downeaster," will be provided by Amtrak with conventional diesel locomotives reaching a maximum speed of 79 miles per hour. The service will terminate at Boston's North Station with stops in Woburn at the Woburn Regional Transportation Center (RTC), Haverhill, Dover, NH, Durham, NH, Exeter, NH, Wells, ME, and Saco, ME. Total trip time between Portland and Boston is projected to be two hours and 30 minutes compared to 2 hours by automobile. By 2010, with eight trains per day, the service is expected to divert approximately 133,000 air travelers by 2010.

Warwick/T.F. Green Commuter Rail Station

An intermodal station is being developed at T.F. Green/Providence Airport in Warwick, RI. This station will provide a commuter rail link from Boston's South Station and the Route 128 Station to the Warwick, RI Station, with people mover access to T.F. Green/Providence Airport. This access improvement will allow more residents of the Boston Metropolitan Area to use the frequent, low-fare air services of T.F. Green/Providence Airport. It is estimated that this service will divert approximately 128,000 passengers from Logan Airport in 2010. The Environmental Assessment was approved in 1999. The design process is underway with construction slated to be completed by the end of 2002.

North-South Rail Link (NSRL)

A rail tunnel linking North Station and South Station, which is a Massachusetts Bay Transportation Authority (MBTA) initiative, has been under environmental review by the MBTA for several years. The proposed rail tunnel would improve the Boston metropolitan commuter rail system by allowing the MBTA to link both of its commuter rail systems and would improve intercity travel by allowing Amtrak to extend its Northeast Corridor rail service to North Station and beyond to the Woburn RTC. Early analysis indicated that the project could divert approximately 47,000 air passengers in the year 2020. Completion of the NSRL Draft EIR has been delayed because of a lack of funding for the project.

Northern New England High Speed Rail Initiative

In March 1999, the states of Massachusetts, Maine and New Hampshire filed a joint application with the Federal Railroad Administration to designate the Portland-Boston rail corridor a high-speed corridor. In August 2000, Massachusetts joined with Vermont and New Hampshire to file a similar application for the Boston-Montreal corridor (which would run diagonally across New Hampshire). Federal transportation officials approved both of these applications in October 2000, making the participating states eligible to apply for Federal money to fund safety and capacity improvements on higher-speed rail lines.

2.7.2 Video Conferencing

Section 2.4.3 of the Airside Project Draft EIS/EIR identified video conferencing as a potential substitute for business-related air trips. The Airside Project Draft EIS/EIR also noted that while video conferencing capabilities could reduce the need for certain business-related air trips, it was also likely to create new, global business opportunities and stimulate business-related air travel. Many analysts anticipate that video conferencing will result in a net increase in air travel demand. Thus far, the technology has failed to advance as quickly as telecommunications analysts had envisioned and has not been widely adopted by businesses. For this reason, Massport does not anticipate that video conferencing will have a material impact on Logan's air travel in the near term.

2.8 Ground Access Improvements at Logan and the Regional Airports

In his Certificates on the *Logan Airside Improvements Draft EIS/EIR* and the *1998 Annual Update*, the Secretary of Environmental Affairs directed Massport to report on the status of the ground access improvements at Logan Airport and at the primary regional airports that can relieve Logan Airport: T.F. Green/Providence, Manchester and Worcester Regional airports. Table 2.8-1 describes the major ground access projects at the regional airports.

The Secretary also directed Massport to quantify the impacts of these ground access improvements on passenger levels at the specified airports. Ground access enhancements can improve passenger convenience by reducing roadway congestion and travel times. However, adequate ground access is just one of many factors that affect a passenger's decision when choosing from multiple airport options. Other factors that override the ground access factor include airline services available at each airport: the number of daily flight frequencies; the timing and availability of the flights; whether the services are operated with jet or turboprop aircraft; airfares; the particular airlines that serve the airport; and whether the destination can be reached with a direct or a connecting flight.

Ground service improvement projects that improve access to airports that already benefit from convenient access, such as the widening of Route 3 north leading to the Manchester Airport, are not expected to materially alter airport usage patterns. Other ground access projects which offer alternative modes to an airport, such as the Silver Line or Airport Intermodal Transit Connector (AITC) projects that create bus links to Logan Airport, are also not expected to alter air passenger levels at Logan Airport. On the other hand, projects which conveniently link a congested airport service area to an alternative, less congested airport, such as the Warwick Intermodal Station, may have the potential to influence airport usage patterns. It is estimated that the Warwick Intermodal Station, which will provide a rail link from downtown Boston and the Route 128 station to the T.F. Green/Providence Airport, could divert up to 128,000 passengers annually from Logan Airport to T.F. Green/Providence (see Table 2.8-1).

Logan Airside Improvements Planning Project		Supplemental DEIS/FEIR		
Table 2.8-1 Ground Access Planning Initiatives at Logan, T.F. Green/Providence, and Manchester Airports				
Initiative	Project Description	Lead Organization	Status Report	Projected Completion Date
Logan Airport				
Airport Intermodal Transit Connector (AITC)	Implementation of a Bus Rapid Transit Route to connect South Station with Logan Airport through the Ted Williams Tunnel. The project will use 60-foot, low-floor, articulated buses in conjunction with the Silver Line.	Massport	Fully approved. In process of selecting and purchasing vehicles. Service will commence as soon as the MBTA Transitway is completed. In the interim, the Logan DART bus service opened on November 16, 2000, and links South Station and the Logan Airport terminals.	2002
Silver Line	Three-part project to develop Bus Rapid Transit routes in Boston. Includes Washington Street Replacement Project, Transitway Phase 1 with tie-in to AITC and Transitway Phase 2.	MBTA	See Below.	
Silver Line: Transitway Phase 1	Includes one-mile tunnel and surface sections to be operated by dual-mode (electric/diesel), articulated buses. Massport will use eight of the vehicles ordered for the AITC to connect South Station with Logan Airport through the Ted Williams Tunnel.	MBTA	Construction has begun on a \$600M bus tunnel to connect South Station to the South Boston Waterfront.	Not earlier than 2001
Silver Line: Transitway Phase 2	Bus Rapid Transit route to connect Washington Street Replacement Project with Transitway Phase I. Tentatively planned to connect with Boylston and Chinatown MBTA subway stations.	MBTA	In September 2000, construction for the Dudley Square to Chinatown segment began. At a cost of \$52M, project will be completed in 2003. Funding for the Chinatown to South Station tunnel is expected in 2004 with construction completed by 2008.	2004-2008
Fourth Logan Express	Planning is underway for a fourth Logan Express location which would serve the North Shore, areas of northeastern Massachusetts, southern New Hampshire, and southeastern Maine. Massport is currently considering a candidate site and moving forward with conceptual design of this facility.	Massport	Site identification and feasibility study underway	Late 2001
Urban Ring	Currently, a series of cross-town bus routes linking low-income and developing Boston area neighborhoods with access to MBTA subway lines. Long-term vision would see the project develop into light rail or dedicated bus ways. One of these cross-town bus routes, the CT3, currently goes from the Longwood Medical area through Roxbury to Logan Airport.	MBTA	In study phase. Implementation not expected for several years.	
Worcester Regional Airport				
Worcester Access Road Improvements	Improvement of access to Worcester Regional Airport from nearby interstate highways. The Regional Access Improvement Study, prepared for the MassHighway in October 1998, identified three feasible alternatives to construct new highways, construct short linking segments and develop existing roads.	MassHighway Department	Project is in the pre-permitting stage. Alternative routes are being analyzed and discussed with the City of Worcester. An ENF was filed, and a Certificate issued on February 11, 2000. A combined Draft EIS/EIR is anticipated to be filed in October 2001, with a Final EIS/EIR filed in Spring 2002.	2004-2007
T.F. Green/Providence Airport				
Warwick Intermodal Station at T.F. Green/Providence Airport	Proposed construction of an Amtrak/ Commuter Rail Station on the Northeast Corridor with a people mover connection to T.F. Green/Providence Airport. Most likely scenario includes moving sidewalk similar to new Logan Airport pedestrian ways; and horizontal elevator similar to Wellington Shuttle in Medford, MA. The governors of RI and MA signed a formal agreement that will allow the MBTA to extend Commuter Rail service to the station when it is completed.	Rhode Island Department of Transportation	Environmental Assessment, which was completed in July 1999, received a Finding of No Significant Impact from the Federal Government. Conceptual design for the project is underway. The City of Warwick and RI Economic Development Council have issued an RFP to develop land near the station. Design work for the station will coordinate with development efforts. Station construction anticipated to begin by the end of 2001.	December 2002
Manchester Airport				
Manchester Airport Access Road	Construction of a limited access highway to connect Route 3 (F.E. Everett Turnpike in New Hampshire) directly to Manchester Airport.	New Hampshire Department of Transportation	Undergoing final phase environmental review process.	2004-2005
Route 3 North Improvements	Upgrade of Route 3 from Route 128 in Burlington to the New Hampshire state line in Tyngsborough. A third travel lane will be built in each direction and shoulders will be widened.	MassHighway Department	In spring 2000, MassHighway awarded contract to design/build consortia. Multiyear construction began in October 2000.	Not earlier than 2003.
Manchester Airport Entrance Roadway	Reconfiguration of Manchester Airport main entrance to ease traffic flow in and out of the airport and connect to the Manchester Airport Access Road when completed.	Manchester Airport	Phase 1 began Summer 2000. Phase 2 is scheduled to begin in 2001. Phase 3, the final phase, is expected to be completed in 2004.	2004



The Greater Worcester Access Road Improvement Project, is expected to significantly improve access from major inter-states to the Worcester Regional Airport. The current access routes to the airport are perceived by passengers and airlines as confusing and inconvenient. By significantly improving access to the airport, The Greater Worcester Access Road Improvement Project, can positively impact airport passenger levels. The impact of the proposed project on Worcester Regional Airport passenger levels is being studied and will be reported on in MassHighway's *Greater Worcester Access Improvement Project, Draft EIS/EIR* (expected filing date is October 2001).

2.9 Initiatives in Support of Regional Transportation Options

Federal, state, and local transportation agencies are collaborating to develop and evaluate regional transportation options in New England which will ease the burden on Logan Airport. This section discusses the ways in which these agencies are achieving this shared goal. Table 2.9-1 summarizes major past and planned investments at regional airports and highlights cooperative funding efforts.

2.9.1 Agency Roles in Regional Transportation Planning

Massport

Massport is promoting the use of regional airports and travel modes to provide relief to Logan Airport. As an independent authority that owns and operates Logan Airport and Hanscom Field, operates Worcester Regional Airport, and owns and operates the Tobin Bridge as well as many properties in the Port of Boston, Massport is just one of many agencies that influence regional transportation policy. With regard to aviation, Massport's primary responsibilities are the provision, operation, and maintenance of airport infrastructure at Logan Airport and Hanscom Field, and operation of Worcester Regional Airport. On April 15, 1999, Massport entered a Memorandum of Understanding (MOU) with the City of Worcester, Massachusetts and the Worcester Airport Commission. The MOU contemplates Massport's takeover of Worcester Regional Airport in two separate phases. In January 2000, the first phase, assumption of operating responsibility, occurred. The second phase, transfer of ownership, is anticipated to be effected by separate agreement by 2005.

Table 2.9-1
Investments in the Region's Airports

Airport	Investments up to December 2000	Proposed Investments in Next Five Years
T.F. Green/Providence	<i>\$100M FAA Funds</i> <i>\$11M Rhode Island Airport Corp.</i> New Passenger Terminal New Roadways New Parking Garage Airfield Improvements – Taxiway and Runway Reconstruction Residential and School Sound Insulation	<i>\$25M FAA Funds</i> <i>\$18M Rhode Island Airport Corp.</i> <i>\$25M Federal Rail Administration</i> <i>\$5M State</i> Expand Terminal Facilities Amtrak Rail Station and People Mover to Terminal Complex Improved Runway Safety Complete Residential and School Sound Insulation
Manchester Airport	<i>\$75M FAA Grants</i> <i>\$7M Manchester Airport Authority</i> New Passenger Terminal New Parking Garage Improved Runway Instrumentation Runway Extensions (under construction) Residential & School Sound Insulation	<i>\$70M FAA</i> <i>\$105M Manchester Airport Authority</i> <i>\$75M Federal Highway Administration</i> Expand Terminal Expand Parking Garage Provide CAT III Instrumentation to Runway 35 and add ILS to Runway 24 Continue Sound Insulation and Property Acquisitions Complete Runway and Taxiway Extensions Access highway connection to F.E. Everett Turnpike and Route 3
Worcester Regional Airport	<i>\$17M FAA Grants</i> <i>\$2M City of Worcester</i> New Terminal Building Improved Runway Safety Improved Instrumentation to reduce Weather Cancellations	<i>\$20M FAA</i> <i>\$2M City of Worcester</i> <i>\$50M Mass Highway</i> Airfield Enhancements Improved Runway Safety Greater Worcester Access Improvements
Pease International Tradeport	<i>\$23M FAA Grants</i> <i>\$2M Pease Development Authority</i> New Terminal Building Reconstruction of Runways and Taxiways Improved Instrumentation and Approach Lighting	<i>\$10M FAA Grants</i> <i>\$1M Pease Development Authority</i> New Access Road/Auto Parking General Airfield Improvements

Since Massport has no jurisdiction over the development, operation, or use of infrastructure at airports other than Logan, Hanscom Field, and Worcester Regional, or over the use of inter-city rail, Massport's role in regional transportation planning often focuses on cooperative planning with other airports and agencies. The following subsections discuss those agencies, other than Massport, that assume responsibility for the development and operation of other airports and inter-city rail

Federal Aviation Administration (FAA)

The FAA, an agency of the US Department of Transportation (U.S. DOT), is the principal Federal entity responsible for national aviation planning and airspace management in the United States. The FAA employs several mechanisms for supporting the planning and development of the nation's airport infrastructure: prepare the *National Plan of Integrated Airport Systems*; administer the Airport Improvement Program (AIP) Trust Fund; approve Passenger Facility Charges (PFCs); and promulgate standards and guidelines for airport design and construction. By law, the FAA cannot dictate the airports that an airline may serve; the schedules that an airline may offer; or the fares that an airline may charge. The airlines make all of these decisions according to market conditions and their respective operating strategies. However, the FAA does approve operating specifications with respect to new entrant airline services at individual airports.

Beginning with the first regional assessment for a new airport, the FAA New England Office has been an active partner in regional aviation planning in New England. The FAA has also funded all of the aviation planning efforts listed in Table 2.9-2. The FAA will play the same role in the upcoming *New England Airports System Study*. The study will evaluate the impact of recent regional airport developments on Logan Airport, identify constraints to regional airport growth, and highlight strategies for optimizing New England's regional aviation system.

The proposed draft scope of work outline for this study is presented in Table 2.9-3 (see also Appendix B). As early as 1990, the FAA began prioritizing its Airport Capital Improvement Plan (ACIP) to reflect the importance of AIP funding development at the Manchester and T.F. Green/Providence Airports in the regional system.

In conjunction with the proposed *New England Airports System Study*, the FAA, through the United States Department of Transportation's "One DOT" initiative, has formed an intermodal group that includes the Federal Highway Administration (FHWA), the Federal Transit Authority (FTA), and the Federal Rail Administration (FRA). The purpose of the intermodal group is to discuss and coordinate planning and development that can impact the Boston regional transportation system.

Table 2.9-2
New England Regional Transportation Planning Studies

Year	Study	Author	Conclusions
1989	Boston Regional Airport System Study	Massport	Scheduled service at regional airports will re-capture some passengers that were using Logan, but growth in demand at Logan will continue. High speed rail service to New York provides some relief, but there will be a need for a major second airport beyond 2010.
1990	High Speed Rail Benefits Study*	Coalition of Northeastern Governors (CONEG)	Electrification of Northeast Corridor rail would shift 2.2 million passengers from air to rail by 2010.
1991	Second Major Airport Study*	Massachusetts Aeronautics Commission (MAC)	Developing a second major airport would require a 10- to 15-year planning horizon for site selection and environmental review in addition to a multi-year construction period. While the SMA identified sites for further study, none of the sites had good access to Logan's core market area and there was significant opposition to siting a new airport anywhere in Massachusetts. Therefore construction of a second airport is not a solution for accommodating demand for the foreseeable future.
1993	Strategic Assessment Report (SAR) *	FAA and Massachusetts Aeronautics Commission (MAC)	High speed rail, development of the regional airports, and infrastructure improvements at Logan Airport are all needed to accommodate the region's growing demand for inter-city travel. The SAR recognized the importance of Runway 14/32 for reducing delays at Logan and the limitations of peak hour pricing. Further, the SAR clearly stated that peak hour pricing would impose "significant costs to travelers, commuter operators and air carriers, and the local economies of numerous cities and towns."
1995	New England Transportation Initiative (NETI)	New England Governor's Council	Coordinated planning is necessary to enhance the competitiveness of regional airports and the efficiency of the region's air transportation network. Procedural and infrastructure improvements at Logan are also necessary to mitigate increasing congestion and delay at the region's primary airport.
1995	New England Regional Airports Air Passenger Service Study*	New England Council, 6 New England States, FAA, Massport and MAC	The study identified sufficient demand at the outlying airports to support improved jet services. The study concluded that expanded jet services, particularly low-fare airline services, at the regional airports would enhance their ability to attract passengers that bypass the regional airports in favor of Logan.
2000	New England Intergovernmental Coordinating Council	Council of New England Governors	The first ICC meeting was held in February 2001. The Council is establishing committees to examine opportunities for inter-modal connections and to recommend interstate transportation initiatives. The ICC members are the six state transportation secretaries, Massport and the regional airport directors.
2001	New England Airports System Study Update*	New England Council, 6 New England States, FAA, Massport and MAC	The <i>New England Airports System Study</i> will evaluate the impact of recent regional airport developments on Logan Airport, identify constraints to regional airport growth, and highlight strategies for optimizing New England's regional aviation system. See Table 2.9-3 for the proposed scope of the study update.

* Partial funding provided by Massport.

Table 2.9-3
New England Airport System Study Proposed Scope of Work

Phase	Tasks	Products
I	■ Regional Aviation Forecasting ■ Studies to Facilitate a Possible Reshaping of the Market	■ New Regional Passenger and Cargo Forecasts ■ Updated Passenger and Fleet Forecasts ■ Identification of Updated Catchment Areas ■ Identification of New Service Market Opportunities
II	■ Evaluation of Major Public Policies, Alternate Airline Strategies, Federal Aviation Policies and Regulations that Guide Regional Systems Planning ■ Evaluation of Federal Aviation Policies or Regulations that Restrict Cooperative Intermodal System Planning ■ Public Policy Development and Action Recommendations	■ Implementation Plan/Program of Major Actions Required to Support a Regional Strategy to Enhance Air Passenger Service ■ Ongoing Planning and Evaluation Capability to Guide Evolution of Regional Strategy
I and II	Ongoing Public and Agency Consultation with Congressional, Business, Environmental and Community Groups	

State Aviation Authorities and Departments of Transportation

State entities involved in aviation planning in New England include statewide aviation authorities and transportation departments. In Massachusetts, the Executive Office of Transportation and Construction (EOTC) coordinates statewide transportation planning and compiles the Statewide Transportation Improvement Program (STIP). The Massachusetts Aeronautics Commission (MAC) performs licensing and reviews activities at all civil airports in the state, except for Logan Airport and Hanscom Field, which fall under Massport's jurisdiction. The MAC was also the lead agency for the *State Airport System Plan*, *The Second Major Airport Study*, and the *Strategic Assessment Report*. In addition, MAC was a co-sponsor, along with Massport, for the *New England Regional Airports Air Service Study*.

The New England state aviation directors and departments of transportation formed a unique alliance with the FAA, Massport and regional airport authorities to study regional airports in 1994. This alliance produced the *New England Regional Airports Air Passenger Service Study* in 1995.

Local Airport Proprietors

At the local level, airport authorities, commissions and municipal departments own and operate civil airports. Local airport proprietors supply, operate, and maintain airport infrastructure, which includes the runways, taxiways, terminal facilities, parking facilities, and access roads. The airport proprietor plays no role in the decisions of private airlines

regarding airfares, airline routes or service levels, but routinely engages in marketing activities to foster air service development.

Federal Railroad Administration (FRA)

The FRA is the Federal agency within the U.S. DOT that plans and funds inter-city railroad projects. The agency promotes safe, environmentally sound and effective rail transportation in the United States. The FRA was the principal funding source for the recently-completed Northeast Corridor Improvement Project (NECIP), which allows high-speed train travel between Boston and New York.

Federal Highway Administration (FHWA)

The FHWA is the federal agency within the U.S. DOT that provides expertise, resources, and information to continually improve the quality of the nation's highway system and its intermodal connections. These goals are accomplished through two main FHWA programs. The Federal-Aid Highway Program provides federal funds to the States for new construction and improvements to the National Highway System, urban and rural roads, and bridges. The Federal Lands Highway Program provides access to and within public lands, such as national forests, by preparing plans, letting contracts, supervising construction, and conducting bridge inspections and surveys. The FHWA also conducts and manages a comprehensive research, development, and technology program to support the nation's highway system.

2.9.2 Regional Transportation Planning and Development in New England

The proposed Airside Project improvements at Logan are an important component of a broader regional transportation strategy that has been evolving for more than a decade. A series of regional transportation planning studies beginning in 1989 examined various strategies and modes for accommodating the growing demand for inter-city travel and for relieving congestion and delays at Logan Airport. Each study built upon the conclusions of prior studies and included participation from a range of transportation interests and agencies.

The key regional planning efforts and their principal conclusions, which were described in Section 2.2.1 of the Logan Airside Improvements Planning Project Draft EIS/EIR, are summarized below and in Table 2.9-2.

These regional transportation planning studies have consistently recommended the development of High Speed Rail in the Northeast Corridor, a growing role for the regional airports, and infrastructure improvements at Logan as essential elements of a regional transportation strategy. The recommendations and goals put forth by these regional planning efforts are now being achieved in New England.

- Low-fare airlines, notably Southwest Airlines, Delta Express, and MetroJet, as well as other major United States airlines, have substantially expanded jet services at the T.F. Green/Providence and Manchester airports. As a result, these airports have increased their roles in accommodating the region's air travel demand and are providing considerable traffic relief for Logan Airport, particularly for passengers originating from points to the north and south of Logan's core service area.
- The electrification of the northern portion of the northeast corridor rail has been completed and Amtrak's high speed Acela service was initiated in December 2000. This service will provide relief to Logan by accommodating some of the inter-city air passenger demand in the Boston-New York market, which is Logan Airport's largest origin-destination market.
- An intermodal station being developed at T.F. Green Airport in Warwick, RI will provide a commuter rail link from Boston's South Station and the Route 128 Station to the Warwick, RI Station with people mover access to T.F. Green Airport. This access improvement will allow more residents of the Boston Metropolitan Area to utilize T.F. Green's frequent, low-fare air services.
- Substantial infrastructure improvements at the regional airports have been completed and others are in various stages of planning or construction.
 - Since 1996, investments made at T.F. Green Airport include a \$207-million terminal building and seven additional aircraft gates. In 1999, investments included a \$1.5-million expansion with a new Federal Inspection Facility (FIS) and parking facilities.
 - The Manchester Airport is involved in a 9-year, \$260 million capital improvement project. The project includes reconstruction and lengthening of both runways; an ILS upgrade; taxiway work; expansion of the terminal building; a parking garage; and a new roadway entrance. The New Hampshire Department of Transportation is also planning a \$75 million highway that will connect the airport to the F.E. Everett Turnpike. Construction of the roadway is expected to begin after 2000.
 - The Massachusetts Highway Department (MassHighway) is studying alternatives for an east-west connector road that would improve access to and within the City of Worcester and to the Worcester Airport. MassHighway filed the Greater Worcester Access Road Project Environmental Notification Form (ENF) at the end of 1999. In February 2000, the Secretary of the Executive Office of Environmental Affairs (EOEA) issued a decision on the ENF requiring an EIR. A combined Draft EIS/EIR is expected to be filed in October 2001.

- In January 2000, Massport assumed operational control of Worcester Regional Airport to increase its utilization and provide relief to Logan for traffic originating in Central Massachusetts and the MetroWest suburbs.
- Massport continues to invest in Logan Airport, which will remain the region's principal airport. It is completing landside improvements and is proposing Airside Project improvements that will allow Logan to operate more safely, reliably and efficiently, resulting in less congestion and delay.

2.9.3 Massport's Initiatives in Support of Regional Alternatives

Massport advocates a regional transportation policy to improve the efficient use of the region's transportation infrastructure by appropriate expanded use of regional airports and alternative transportation modes. To achieve this policy goal, Massport is committed to cooperative transportation planning and is actively working with a broad array of transportation agencies and concerned parties to ensure an integrated, multi-modal regional transportation network. Massport has undertaken several initiatives to advance the role of regional airports in accommodating a greater share of the region's air travel demand. Massport is also participating in several interagency transportation planning forums pertaining to alternative, inter-city travel modes. The *1996, 1997, and 1998 Annual Updates* and the *1999 Environmental Status and Planning Report* (formerly the GEIR) describe some of these past initiatives and cooperative planning ventures. The following subsections describe Massport's more recent initiatives.

Massport Involvement in Cooperative Planning Initiatives

- Massport continues to maintain an aviation information database and distributes quarterly summary reports that track aviation trends at all of the regional airports to parties interested in promoting regional airport services. Massport compiles and issues monthly statistical summaries of passenger levels, aircraft operation counts and airline schedule data at each regional airport. At the end of each year, Massport also prepares an annual report summarizing regional airport trends and service developments.
- Massport participates in meetings of other regional and state aviation organizations and the MAC. Topics discussed at these meetings include airfield and terminal improvements at state airports; capital improvements at New Bedford, Martha's Vineyard, and Nantucket; and the Worcester Marketing Program.
- In January 1999, the Transportation Research Board (TRB) invited the FAA, Massport and MAC to present their collaborative regional planning efforts as a national model for regional aviation system planning.

- On November 23, 1999, Massport participated in a "Regional Transportation Summit" that it sponsored with the Cellucci/Swift Administration. This summit enjoined New England governors, transportation officials, and business leaders to discuss joint transportation initiatives in New England. The agenda included a panel discussion on aviation, which focused on joint marketing initiatives among the major commercial airports in New England and the economic value of airports to the New England economy. At the close of the Summit, state leaders agreed to the following action steps:
 - Encourage the Massachusetts legislature to pass the Transportation Bond Bill to increase rail service to Providence. This legislation was passed, and through the Pilgrim Partnership formed between the MBTA and Rhode Island, in July 2000, three additional commuter rail trains were added between Boston's South Station and Providence. The additional rail services, coupled with the link that is under-construction to the T.F. Green/Providence Airport will increase transit options for Boston passengers seeking use of the T.F. Green/Providence airport.
 - Create a joint marketing program to promote the region's airports to air passengers inside and outside New England. The program includes detailed brochures that display the region's airports, their airlines, and major access routes. The program also involves participation in industry trade shows to promote the regional airports. A joint web site, *flynewengland.com*, linked with the various airport and state aviation home pages, and with travel and tourism sites, has been developed.
 - Establish a comprehensive rail plan for all of New England to integrate each state's assets and needs into one regional strategy. Since the Summit, the Executive Office of Transportation and Construction has partnered with New Hampshire to develop commuter rail from Lowell, MA to Nashua, NH. Furthermore, Massachusetts has joined other New England states to ask the Federal Rail Administration to designate two high-speed, rail corridors. In March 1999, Massachusetts, Maine, and New Hampshire jointly filed applications for a Portland-Boston designation. In August 2000, Massachusetts, Vermont, and New Hampshire jointly filed an application for a Boston-Montreal designation. Federal transportation officials approved both of these applications in October 2000, making the participating states eligible to apply for Federal money to fund safety and capacity improvements on higher-speed rail lines.
 - Meet annually to discuss regional transportation issues and accomplish regional goals to improve infrastructure development, use, and efficiency.
- In December 1999, Massport met with MassHighway and MAC to develop the Regional Airport Signage Program. MassHighway developed signs to direct Massachusetts residents to the Manchester, T.F. Green/Providence and

Bradley/Hartford airports, and installed them in February 2000. MAC provided \$20,600 in funding for the signage program.

- Massport spent \$80,000 on a print advertising program to promote regional airports. The program ran advertisements in newspapers west of I-495 and near the Connecticut, New Hampshire, and Rhode Island borders to promote the advantages of regional airports over the traffic and congestion at Logan Airport.
- In 2000, Massport, the FAA and the regional airport directors agreed to jointly undertake a *New England Airports System Study*. This study will evaluate the performance of the regional airports since the completion of the 1995 Regional Airports Air Passenger Service Study. It will re-evaluate airport market areas and capture rates in light of the significant air service changes that have occurred in the last few years; evaluate the potential for international, charter, and cargo services at the regional airports; evaluate capacity issues at each of the airports; and consider the development of high occupancy vehicle/ground transportation and rail alternatives to improve access to the regional airports. (See Table 2.9-3 and Appendix B).
- In January 2001, Massport committed \$500,000 to a regional marketing plan, to encourage air travelers to fly out of regional airports, when possible, instead of Logan. The marketing campaign will consist of TV ads, printed materials, and industry trade shows to promote the regional airports.
- On February 16, 2001, Massport participated in the first meeting of the New England Intergovernmental Coordinating Council Meeting.

Worcester Regional Airport: Marketing and Planning Initiatives

Since 1995, Massport has been working with the City of Worcester to develop strategies to realize its airport's full potential, thereby improving the New England air transportation network. Recent efforts are summarized below.

- In accordance with an Operating Agreement with the City of Worcester and the Worcester Airport Commission, Massport assumed operational responsibility for Worcester Regional Airport on January 15, 2000.
- Massport has secured new nonstop services at Worcester Regional Airport:
 - In February 2000, Atlantic Southeast Airlines, a regional carrier subsidiary of Delta Air Lines, began serving Worcester Regional Airport market with two daily flights to Atlanta, with 50-seat Canadair Regional Jets. This service has been highly successful. During the first four months of service, load factors reached 73 percent, climbing to 94 percent in August 2000. Delta will increase its Worcester-Atlanta service to three daily roundtrips in April 2001.

- In July 2000, American Eagle initiated nonstop flights to New York JFK International Airport. The service is operated three times per day, with 34-seat Saab 340 turboprops.
- In February 2001, Pan Am began daily nonstop jet service to Orlando Sanford International Airport.
- Massport has embarked on an aggressive marketing campaign targeted to travelers and the airlines:
 - Massport launched an advertising campaign promoting the headline "Even Worcester Airport has delays ...five minutes to park, two minutes to check in." The campaign targets travelers within 25 miles of the airport and builds awareness of its new air services and convenience. The campaign runs advertisements in area cinemas and local newspapers, and on local radio stations. Additionally, Massport hired a full-time marketing manager to promote the airport to airlines, travel agents, local businesses, and residents.
 - Massport is engaged in a strategic marketing plan to attract airlines that could provide services at Worcester Regional Airport. To date, Massport presented air service proposals to Spirit Airlines, Jet Blue, American Trans Air, American Airlines, Delta Air Lines, Continental Airlines, Shuttle America, and Pan Am. Other airlines are also being targeted for new services at Worcester Regional Airport.

Other Cooperative Regional Transportation Planning Efforts

- Massport supports inter-city rail planning through its membership in the Boston Metropolitan Planning Organization (MPO). The MPO is a cooperative planning board that consists of these other state and regional agencies: EOTC; MassHighway; Metropolitan Area Planning Council (MAPC); MBTA; and the MBTA Advisory Board. Massport and the other MPO agencies prepared the *Transportation Plan for the Boston Region and the Boston Transportation Improvement Program (TIP)*.
- Rhode Island Governor Lincoln Almond hosted the second annual New England Regional Transportation Summit on December 14, 2000. Joining Governor Almond was Massachusetts Governor Cellucci, Connecticut Governor John Rowland, and Massport officials. The Governors cited aviation, truck transportation and the movement of more goods by rail as their top transportation priorities, and resolved to re-establish the New England Governors Conference Committee on Transportation as a regular forum for discussing regional transportation initiatives. (See Appendix B for the New England Governors' Resolution.)

2.10 Conclusion

New England's demand for high-speed intercity travel, particularly air travel, has increased over time and will continue to increase in the future. This poses significant challenges for the region which is increasingly congested on its roads and interstate highways, and at Logan, its principal airport. Major investments and innovative solutions are needed to accommodate future travel demand efficiently and with minimal congestion. Reducing travel delays provides widespread regional benefits by eliminating wasted time, promoting stable economic growth, and minimizing negative environmental impacts.

Local, state and federal agencies throughout the region share the goal of improving New England's transportation network and have already begun to work, both independently and cooperatively, to achieve that goal. Great strides have been made in the last decade. Regional airports have become meaningful options to Logan Airport and passengers traveling to and from New York can now choose high-speed rail over air travel.

These are significant achievements that resulted from years of planning efforts involving many different agencies. Local airport authorities and the FAA were responsible for significant infrastructure investments at the region's airports. Through individual and cooperative efforts, the regional airports have attracted meaningful airline services and have increased their share of the region's travel demand. Massport has assumed operating responsibility for the Worcester Regional Airport, which is capable of handling more of the region's air travel. In just one year, Massport obtained new air services for the airport which resulted in a two-fold increase in Worcester's passenger traffic. State governments have undertaken a number of road and commuter rail projects to improve access throughout the region and make regional airports more accessible. The Federal Rail Administration and Amtrak have implemented high-speed rail along the Northeast Corridor, the only active high-speed rail service in the nation.

While these are meaningful accomplishments, the process for ensuring a balanced, integrated and efficient regional transportation system is on-going. The states are evaluating additional opportunities for high-speed rail services in New England. The FAA and Massport are sponsoring a *New England Airports System Study* to identify new opportunities for growth at the regional airports and other innovative initiatives. Massport is spearheading a cooperative marketing campaign to attract more passengers to the regional airports. Massachusetts and Rhode Island are cooperating to bring rail access to the T.F. Green/Providence Airport. All agencies are doing their part to ensure that the region meets its long-term transportation objective.

Many of the region's transportation projects and planning efforts are directed at creating and expanding transportation options to Logan Airport. Experience shows that increasing the role of regional airports reduces the rate of passenger growth at Logan by distributing air passenger growth across the region. Yet, Logan plays a critical role in the

regional transportation network. It is closest to the majority of the region's travel demand and the only airport in New England that can serve the long-haul domestic and international travel needs of the region. Even with regional airports and rail improvements, Logan will continue to be a vital part of the regional transportation network and its passenger levels will continue to grow. From a regional system planning perspective, it is imperative that Massport improve the efficiency of Logan Airport, since Logan serves the greatest number of passengers and there is no other airport or group of airports that could fulfill the role that Logan plays as the primary airport for the region within I-495 and the region's gateway for nonstop services to long-haul domestic and international destinations.

Massport's Logan Modernization Program, which will be completed in the coming decade, is improving the airport roadway network and upgrading the airport's landside facilities. The proposed Airside projects are also needed to improve the efficiency and reliability of Logan's airside operations.

Despite past and planned efforts to improve regional transportation options, Runway 14/32 is the only measure that can eliminate Logan delays that occur during northwest wind conditions. If Runway 14/32 is not built, the majority of the region's air travelers will continue to suffer from unreliable and inefficient air travel at Logan Airport.



3

Alternatives

Key Points

In the *Airside Improvements Planning Project Draft Environmental Impact Statement/Environmental Impact Report* (Airside Project Draft EIS/EIR), Chapter 3 provided a detailed description of the improvement concepts. In this Supplemental DEIS/FEIR, these alternatives are reviewed again, but in more summary form. In addition, this chapter discusses demand management strategies at US and international airports, including previous Massport efforts at Logan, for relevance to the current Peak Period Pricing concept.

- The following improvement concepts designed to reduce congestion and delays and enhance safety at Logan Airport were evaluated in the Airside Project Draft EIS/EIR prior to selection of the Preferred Alternative:
 - **Unidirectional Runway 14/32** was designed to address delays during northwest winds and to provide a third active runway during conditions that now require Logan to operate on two or fewer runways. All arriving and departing flights using Runway 14/32 would occur over Boston Harbor. This additional three-runway configuration with proposed unidirectional Runway 14/32 would enable better conformance with the PRAS runway use goals designed to more equitably distribute noise impacts among affected communities.
 - **Taxiway improvements** were designed to reduce taxiway congestion and enhance safety, facilitating more efficient movement of aircraft between terminal areas and runways during takeoff and landing operations. By reducing congestion and simplifying the taxiway system, the taxiway improvements will reduce the potential for runway incursions and wingtip conflicts.
 - **Reduced approach minimums** for Runways 15R, 22L, 27 and 33L will increase the availability of these runways, reducing reliance on Runway 4R in low visibility and enhancing safety under adverse operating conditions. The Runway 22L and Runway 27 minimums will be reduced to levels consistent with the capabilities of the existing navigational equipment, while approaches to Runways 15R and 33L will be upgraded to Category III Instrument Landing Systems (ILSs). Reduced minimums will also increase the opportunity to achieve short- and long-term Preferential Runway Advisory System (PRAS) goals.
 - **Peak Period Pricing** designed to reduce delay by eliminating flights during periods when demand exceeds the airfield's capacity for a sustained period of time.

- A runway length (exclusive of safety areas) of 5,000 feet was selected for unidirectional Runway 14/32 based on the finding that this runway length would accommodate a greater proportion of the regional carrier fleet than the alternative 4,500 foot length and therefore was more effective in reducing delay.¹
- An illustrative peak period fee of \$150 per operation was selected in a screening process, based on the finding that this fee would be effective in reducing delay in a future High Fleet scenario with airline overscheduling during the peak hours.²
- The alternatives evaluated consist of the following combinations of improvement concepts:
 - Alternative 1 – All improvement concepts
 - Alternative 1A – Preferred Alternative -- All improvement concepts, except Peak Period Pricing
 - Alternative 2 – All improvements concepts, except Runway 14/32
 - Alternative 3 – No Build, operational improvements and Peak Period Pricing only
 - Alternative 4 – No Action
- Alternative 1A was selected as the Preferred Alternative because it significantly reduces delays without imposing the economic costs on regional carriers and small communities associated with Peak Period Pricing. The Preferred Alternative achieves certain environmental benefits that include improved air quality and a reduction in noise for the most severely impacted communities, while causing minimal environmental impacts that would be mitigated.
- As discussed in Chapter 2, regional alternatives (including development of the regional airports and high speed rail services) will play an important role in the emerging regional transportation system by diverting from Logan a portion of its short- and medium-haul demand. Logan, however, will remain the region's major airport for long-haul domestic and international travel and continue to serve as a primary point of access to the national air transportation system for passengers from small- and medium-sized New England communities. The proposed airfield improvements for reducing delay are necessary for Logan to operate reliably and efficiently in the regionalized transportation system.

In response to the Secretary of the Executive Office of Environmental Affairs (EOEA) Certificate on the Airside Project Draft EIS/EIR (May 7, 1999), additional analyses were performed to assess the impact of previous differential pricing programs at Logan. While it was not a Peak Period Pricing program, Logan's 1988 Program for Airfield Capacity Efficiency (PACE) increased landing fees for operators of small aircraft, including



¹ A runway longer than 5,000 feet was analyzed earlier. It would require construction into the harbor and was therefore considered impractical.

² The fleet forecasts include High Fleet and Low Fleet operations scenarios for each passenger level. The Low Fleet scenarios assume more large jet operations than non-jet operations, similar to current conditions, while the High Fleet scenarios assume a greater proportion of smaller non-jet aircraft and thus a higher level of total operations for the same passenger level. The higher number of small aircraft in the High Fleet scenarios reflects airline overscheduling conditions.

regional carriers and general aviation. During the six-month period when PACE was in effect, flight activity levels within these segments did decline, but it would be incorrect to attribute these changes to PACE alone. A review of factors influencing Logan flight activity during this period indicates that consolidation within the regional carrier industry and a general downturn in general aviation demand may have had equal or greater responsibility for the observed changes.

3.1 Introduction

A range of Logan-specific alternatives to reduce congestion and delay and enhance safety at Logan have been considered in the Logan Airside Improvements Planning Project (Airside Project). Phase I of the project was initiated in 1993 as a feasibility study that examined the nature of delays at Logan and evaluated the potential delay savings and safety enhancements for a range of individual improvement concepts.³ The concepts evaluated in the Phase I study evolved from alternatives considered in previous studies, most notably the FAA's *Boston Logan International Airport Capacity Enhancement Plan (CEP)*, published in October 1992. Additional sources for the concepts included the *Logan Runway Incursion Mitigation Plan/Taxiway Relocation Study* (December 1993), and recommendations by Massport staff, airlines, and the Air Transport Association (ATA).

Based on the results of the *Phase I Feasibility Study*, the Massport Board in July 1995, selected seven improvement concepts for more detailed operational and environmental analysis through a joint federal and state EIS/EIR. These concepts were presented in the Environmental Notification Form (ENF) for the Airside Project and further developed during the federal and state EIS/EIR scoping process. Consistent with the scope issued by the EOE and the January 1996 EIS Scope issued by the FAA, the Airside Project Draft EIS/EIR assessed the following improvement concepts:

- Construction of a unidirectional Runway 14/32;
- Construction of a Centerfield Taxiway;
- Extension of Taxiway Delta;
- Realignment of Taxiway November;
- Optimization of taxiways in the Southwest Corner of the airfield;
- Reduction in approach minimums on Runways 22L, 27, 15R, and 33L; and,
- Implementation of Peak Period Pricing.

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3 Logan Airside Project Improvements Feasibility Study, Phase I Report, prepared by Jason M. Cortell and Associates Inc. for the Massachusetts Port Authority, July 20, 1995.

The analytical framework was structured to evaluate five distinct packages of improvement concepts, or Alternatives. Alternative 1 includes the full package of feasible improvements (see Figure 3.1-1) and Alternative 1A includes all improvement options except for Peak Period Pricing. Alternative 2 includes all actions except the construction of Runway 14/32 (see Figure 3.1-2). Alternative 3 is a No Build Alternative, employing only the operational and administrative improvement concepts (reduced minimums and Peak Period Pricing). For comparison, Alternative 4 is a No Action Alternative, evaluating the impacts of doing nothing (see Table 3.1-1).

Sections 3.2 through 3.5 discuss each individual improvement concept, and its role in reducing current and projected levels of congestion and delay at Logan. An expanded description of the Alternatives is included in Section 3.6.

The comparative benefits and impacts of the different Alternatives were fully described in Chapters 4 and 8 of the Airside Project Draft EIS/EIR.

After careful review of the extent and causes of delays at Logan and the comparative benefits of each Alternative, FAA and Massport selected Alternative 1A as the Preferred Alternative because it significantly reduces delays without imposing the economic costs on regional carriers and small communities associated with Peak Period Pricing. Peak Period Pricing was not selected because an overscheduling condition does not exist at Logan today.

Alternative 1A achieves certain environmental benefits that include improved air quality and a reduction in noise for the most severely impacted communities, while causing minimal environmental impacts. These minimal impacts would be mitigated as described in Chapter 8.

Table 3.1-1
Logan Airside Improvements Project Alternative Packages

	Alternative 1	Alternative 1A	Alternative 2	Alternative 3	Alternative 4
Improvement Concept	All Actions	All Actions Except Peak Period Pricing	All Actions Except Runway 14/32	No- Build	No Action
Runway 14/32	■	■			
Taxiways					
Centerfield	■	■	■		
Extend Delta	■	■	■		
Realign November	■	■	■		
Southwest Corner Optimization	■	■	■		
Operational					
Reduced Minimums	■	■	■	■	
Peak Period Pricing	■		■	■	

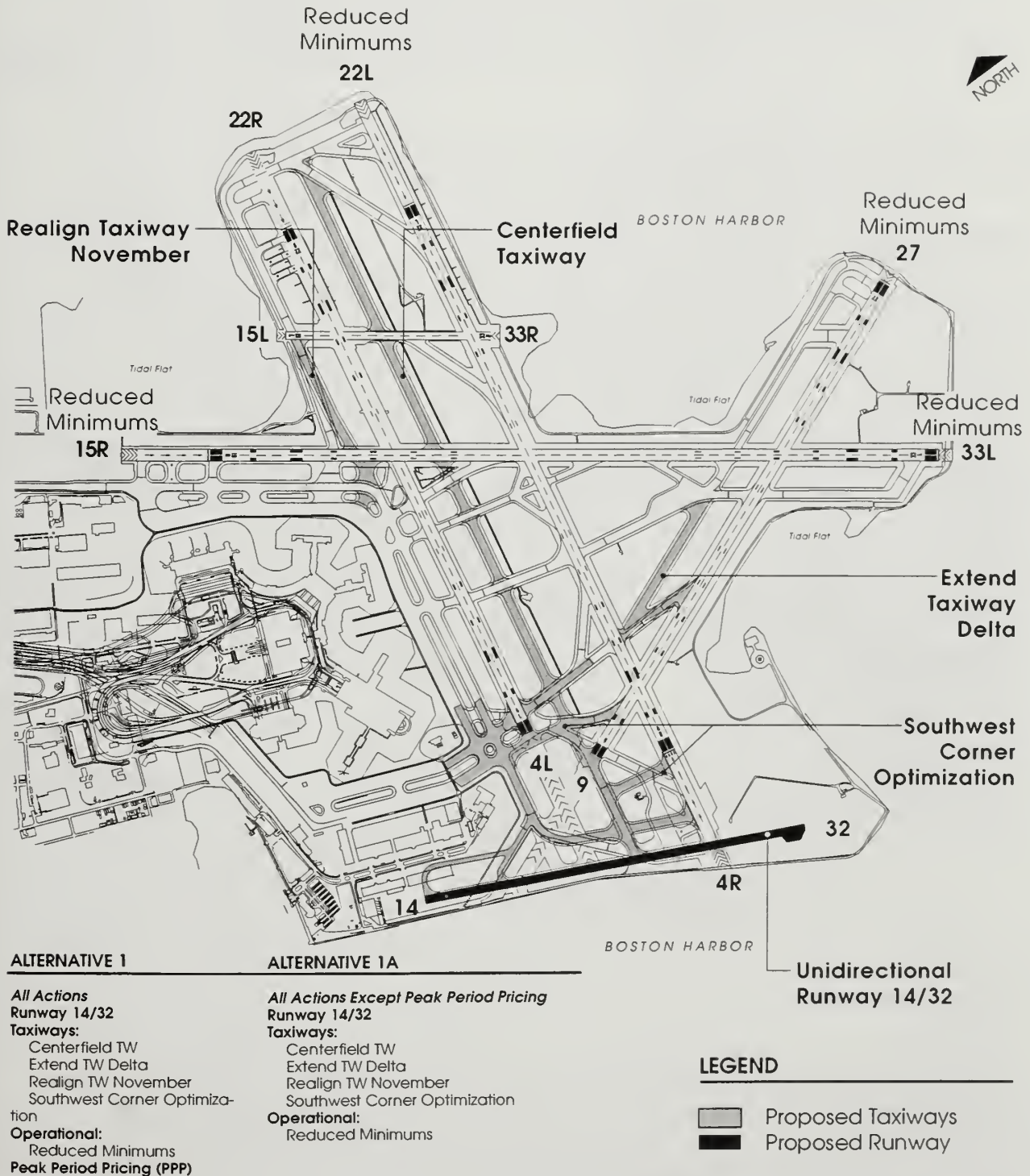


Figure 3.1-1
Potential Airfield Improvements - Alternatives 1 and 1A



3.2 Unidirectional Runway 14/32

This section describes proposed unidirectional Runway 14/32 (illustrated in Figure 3.1-1), including the purpose of this improvement, the process used to screen various runway lengths and layouts, a physical description of the preferred layout, and a brief assessment of technical and environmental issues associated with it.

Unidirectional Runway 14/32 would be located along the southwestern edge of the airport. All arrivals would be from the southeast over Boston Harbor and would touch down at the Runway 32 end and taxi toward the Runway 14 end. All departures would leave from the Runway 14 end, with jets climbing out and heading southeast over the harbor.

Runway 14/32 would address delays at Logan that occur when wind and weather (particularly moderate to strong northwest winds) limit Logan to two-runway configurations and sometimes to single-runway configurations, a major cause of delay. With three runways in visual flight rule (VFR) weather conditions, Logan's capacity is approximately 120 operations per hour. Two runways can accommodate up to 90 hourly operations and a single runway provides 60 or fewer hourly operations. The high proportion of smaller, regional aircraft in the fleet at Logan also contributes to delay, because the separation distances required between larger and smaller aircraft using the same runway are often greater than between two aircraft of the same size. When greater separation distances are required, the time needed to complete each aircraft operation (e.g., landing or takeoff) increases, which can result in additional delay for subsequent operations. Along with the taxiway improvements, the new runway would also enhance operational safety at Logan (e.g., separating large and small aircraft operations, and reducing the potential for runway incursions or wingtip conflicts) by reducing congestion in the air and on the ground.

In addition, Runway 14/32 would provide the FAA with greater flexibility to shift operations among the different primary operating directions in order to be more consistent with the runway use goals embodied in the Preferential Runway Advisory System (PRAS) at Logan. PRAS attempts to reduce the areas subject to the highest noise exposure levels, distribute noise impacts evenly in the long term, limit sustained impacts in the short term by regularly shifting operations when possible, and maximize use of over-the-water procedures.⁴ By providing capacities similar to those available in the north/south configurations, Runway 14/32 would allow a more equitable distribution of jet operations.

3.2.1 Runway Length Screening

An initial screening analysis was carried out in the Airside Project Draft EIS/EIR to determine the Runway 14/32 length to be carried through the detailed operational and environmental analysis process. Alternative runway lengths for a unidirectional Runway 14/32 were screened for their ability to reduce delay, to conform to the PRAS

▼
4 PRAS is described in more detail in Chapter 4, Section 4.3.

goals, and to reduce noise impacts. The purpose of the screening process was to identify the feasible runway length that best achieves these objectives.

The proposed unidirectional Runway 14/32 is intended principally to serve the regional/commuter airlines, which typically operate turboprops and small jets. Therefore, the screening process examined runway lengths (exclusive of safety areas) of 4,500 and 5,000 feet.⁵ A discussion of the screening process and results can be found in Section 3.2.1 of the Airside Project Draft EIS/EIR.

Because a 5,000-foot runway would accommodate a greater proportion of the forecast regional carrier fleet than a 4,500-foot runway, it would provide a greater reduction in aircraft delay, as illustrated in Table 3.2-1. Although the effect of each runway on the achievement of the PRAS goals and on noise impacts varies somewhat depending upon whether the 37.5M Low or 45M High Fleet scenarios are employed, the overall improvements in both criteria favor the 5,000-foot runway.⁶ Therefore, the 5,000-foot runway was selected for further analysis in the Airside Draft EIS/EIR.

Table 3.2-1
Summary Comparison of the Impact of Runway Length on Aircraft Delay

	Runway 14/32 Length	
	4,500 feet	5,000 feet
Percent of Forecast Regional Carrier Fleet		
Able to Land on Runway 32 or Depart From Runway 14		
Low Fleet Scenario (37.5 million passengers)	69%	98%
High Fleet Scenario (45 million passengers)	68%	98%
Percent Reduction in Aircraft Delay		
Low Fleet Scenario (37.5 million passengers)	20%	22%
High Fleet Scenario (45 million passengers)	26%	33%

Runway 14/32 at either length would improve conformance to the PRAS goals, designed to equitably distribute noise among impacted communities, but 5,000 feet is the preferred runway length based on both the long- and short-term PRAS goals. Because the 5,000-foot runway would accommodate a greater variety of aircraft, it would provide better performance relative to the annual goals than the 4,500-foot runway. It would also produce a greater reduction in the total annual hours of persistence exceedence.⁷ The performance of the two runway lengths varies by fleet scenario with respect to the PRAS dwell criteria,⁸ but the differences are very small.



⁵ A runway longer than 5,000 feet was analyzed earlier. It would require construction into the harbor and was therefore considered impractical.

⁶ The screening analysis used the 37.5 million passenger Low Fleet and the 45 million passenger High Fleet. The Low Fleet scenario assumes a high proportion of large jet operations, similar to current conditions, while the High Fleet scenario assumes a greater proportion of smaller non-jet aircraft.

⁷ Persistence is defined as the prolonged utilization of one runway combination between the hours of 7:00 AM and midnight in a period of three consecutive days.

⁸ Dwell is defined as the duration of continuous operations during each day between the hours of 7:00 AM and midnight.

Noise analysis of both runway lengths yielded similar results; generally the 5,000-foot runway produced greater improvements. For the average Day-Night Sound Level (DNL) 65 decibel (dB) and greater criteria, the effect on noise impacts varied by fleet. Population levels exposed to the average day-night noise levels of 70 dB or greater are smaller for the 5,000-foot runway than for the 4,500-foot version under each fleet scenario. For the 75 dB or greater day-night noise level, the 5,000-foot runway exposes a lower population under the 45M High Fleet scenario, while the two runway lengths are equivalent under the 37.5M Low Fleet scenario.

The proposed 5000-foot unidirectional Runway 14/32 is expected to result in a certain fleet utilization percentage, and it is this utilization that drives the environmental impacts of the runway. The initial screening for runway length anticipated a regional fleet dominated by turboprop aircraft, where a 5,000 foot runway was clearly adequate to accommodate all existing and anticipated turboprop aircraft. The emergence of the regional jet called into question the adequacy of a 5,000 foot runway, and resulted in additional analysis using the 37.5M High RJ Fleet in this Supplemental Draft EIS/Final EIR.

According to the airframe manufacturers' specifications and the FAA type certifications, the regional jet types in the Logan fleet are able to land in less than 5,000 feet under standard conditions.⁹ However, the conditions of each flight operation are different. Based on discussions with airlines and airports and the FAA consultant's analysis included in Appendix C, most of the regional jet types forecast to use Logan in the future are capable of landing on a 5,000 foot runway.

The analysis of the runway with the 37.5M High RJ Fleet considers a range of utilization assumptions for specific regional jet aircraft (see Section 4.7.5). Therefore, this Supplemental DEIS/FEIR analyzes the full range of environmental impacts generated by aircraft likely to use Runway 14/32, whether derived from a fleet with a large percentage of turboprop aircraft or from a fleet dominated by regional jets.

3.2.2 Layout Options

FAA-specified runway design criteria and standards were applied to develop three layout options for a 5,000-foot unidirectional Runway 14/32. Descriptions of the applicable FAA criteria and standards are presented below, followed by a physical description of the runway, presentation of the layout options and the results of a qualitative assessment of the three options. Detailed descriptions of the criteria, the runway, the layout options and the assessment procedures are provided in Sections 3.2.2.1 through 3.2.2.4, respectively, of the Airside Project Draft EIS/EIR.

3.2.2.1 FAA Runway Design Criteria and Standards

The FAA has issued Advisory Circulars (AC) governing the layout and design of runways, taxiways and associated safety areas. These Advisory Circulars generally fall within the AC 150/5300 Series.

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⁹ Standard conditions in this case include landing over a 50-foot obstacle when the aircraft is at maximum gross weight, the runway is dry, there is no wind, and the temperature is below 60 degrees Fahrenheit.

FAA Advisory Circular 150/5300-13 Airport Design

The key Advisory Circular is AC 150/5300-13 *Airport Design*, which specifies minimum design and layout standards to be utilized at all airports receiving FAA funding. Runway design requires the identification of a design aircraft category and the lowest designated or planned approach visibility minimums, and then application of the appropriate criteria contained in *Airport Design*. In the Airside Project Draft EIS/EIR, an Airport Reference Code (ARC) of C-III was designated for Runway 14/32, based on the aircraft approach speed and airplane wingspan to be accommodated. The category of aircraft upon which this design is based is regional jets.

The design parameters for Runway 14/32 and an ARC of C-III are defined below and summarized in Table 3.2-2.

- **Runway Safety Area (RSA).** The RSA is a defined surface surrounding the runway that is suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. For Runway 14/32, the RSA is 500 feet wide centered on the runway centerline, and extends 1,000 feet beyond each end of the runway. *Airport Design* requires that the RSA be cleared and graded and have no potentially hazardous surface variations. The RSA shall be free of all objects, unless required for controlling and directing aircraft. The grading shall prevent the accumulation or ponding of water within the RSA, and under dry conditions, the ground within the RSA shall be capable of supporting the occasional passage of an aircraft or aircraft rescue and fire fighting equipment without causing any damage to the equipment or aircraft.
- **Runway Object Free Area (ROFA).** The ROFA is an area on the ground centered on a runway centerline. It is provided to enhance the safety of aircraft operations by having the area free of objects, except for those needed for air navigation or aircraft for ground maneuvering purposes. The ROFA for proposed Runway 14/32 is 800 feet wide, centered on the runway centerline, and extends 1,000 feet beyond each of the runway ends, similar to the RSA.
- **Runway Protection Zone (RPZ).** FAA defines the RPZ as "an area off the runway end to enhance the protection of people and property on the ground." The RPZ is a trapezoidal area, starting 200 feet beyond the threshold of the operational runway and centered on an imaginary extension of the runway centerline for arrivals and departures. Since operations will only occur to or from the Runway 32 end of unidirectional Runway 14/32, the RPZ applies only to the Runway 32 end. The dimensions of RPZs vary depending upon the visibility minimum and the ARC code for the design aircraft. For the Runway 32 end, the length of the RPZ is 1,700 feet with an inner width of 1,000 feet and an outer width of 1,510 feet.¹⁰

▼
10 FAA Advisory Circular 150/5300-13, Chapter 2, Table 2-4.

Table 3.2-2
Design Criteria for Runway 14/32 with an Airport Reference Code of C-III

Item	Design Criteria (feet)
Runway Width	100
Runway Shoulder Width	35 ¹
Runway Safety Area Width	500
Runway Safety Area Length Beyond Runway End	1,000
Runway Obstacle Free Zone Length Beyond Runway End and Width	200
Runway Obstacle Free Zone Width	400
Runway Object Free Area Width	800
Runway Object Free Area Length Beyond Runway End	1,000
Taxiway Safety Area Width	118
Taxiway Object Free Area Width	186
Runway Protection Zone	Length 1,700 / Inner Width 1,000 / Outer Width 1,510

¹ Massport extends the 20-foot FAA minimum runway shoulder width to 35 feet for additional safety and operational benefits.

Source: Tables 3-3 and 4-1 in FAA AC 150/5300-13 *Airport Design*, November 10, 1994.

- **Obstacle Free Zone (OFZ).** The OFZ is the airspace along the runway and extended runway centerline, which is required to be clear of all objects, (except for frangible visual navigational aids (NAVAIDs), which need to be located in the OFZ because of their function). The purpose of the OFZ is to provide clearance protection for aircraft landing or taking off from the runway and for missed approaches. The OFZ is defined as a three-dimensional surface centered above the runway centerline and extending 200 feet beyond each end of the runway. The height of the OFZ is defined as 150 feet above the established airport elevation. The width of the OFZ varies with aircraft and visibility minimums for the runway. For the proposed Runway 14/32, the OFZ is 400 feet wide centered on the runway.
- **Taxiway Safety Area (TSA).** The TSA is a defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway. The TSA for a C-III taxiway is 118 feet wide centered on the taxiway centerline.
- **Taxiway Object Free Area (TOFA).** The TOFA has controlling criteria similar to that of the ROFA described above. For the proposed Runway 14/32, the TOFA is 186 feet wide centered on the taxiway centerline.

FAR 14 CFR Part 77 Objects Affecting Navigable Airspace

A second listing of key design criteria is contained within the body of the Federal Aviation Regulations (FAR) at 14 CFR Part 77. These criteria, under the heading "Objects Affecting Navigable Airspace," address the goals of safe and efficient use of airspace, and define limits around a runway in which objects are considered to interfere with the safe use of the runway.

FAR Part 77 criteria address the protection of the airspace around a given runway. The phrase "FAR Part 77 surfaces" is frequently used in reference to the several "imaginary surfaces" surrounding a runway, which are used to depict the protected airspace and are defined by the technical criteria of FAR Part 77. The basic purpose of FAR Part 77 is to identify objects extending vertically through or above these imaginary surfaces, which may pose a hazard to air navigation.

FAR Part 77 surfaces are defined generally below. FAR Part 77 surfaces for Runway 14/32 are listed in Table 3.2-3 and illustrated in Figure 3.2-1.

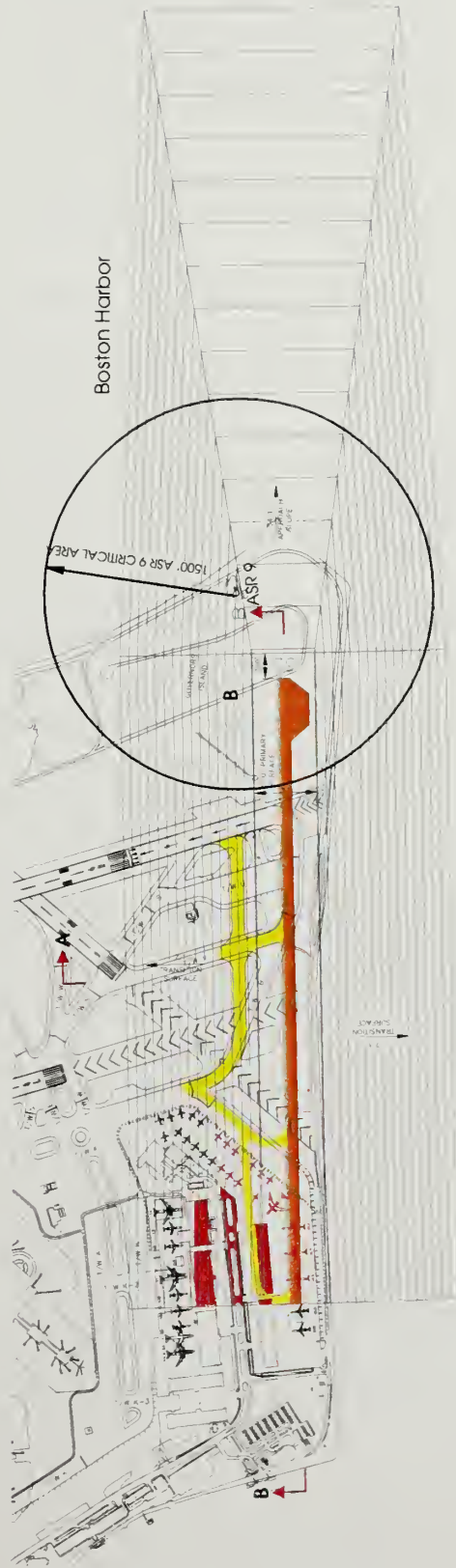
- **Primary Surface.** This surface is a rectangular surface centered along the runway and at the same elevation as the surface of the runway. The length of this surface extends 200 feet off each paved runway end and the width is dependent upon the characteristics and use of the runway.
- **Approach Surface.** This surface is an inclined trapezoidal plane beginning at the narrow end of the Primary Surface and extending outward and upward. The inner, (starting) edge of the Approach Surface is the same width as the Primary Surface; the approach widens at a uniform rate and the outer edge varies with the runway approach minimums. Since approaches only will occur to the 32 end of unidirectional Runway 14/32, the Approach Surface requirements only apply to the 32 end.
- **Transition Surface.** This surface extends upward and outward from the long sides of the Primary Surface at a slope of 7:1 and meets the Approach Surfaces. Since there is no approach surface for the Runway 14 end, the Transition Surface was assumed to "cut off" at the Runway 14 end, terminating the 7:1 slope.

Table 3.2-3
FAR Part 77 Surfaces for Runway 14/32

Type of Surface and Geometric Parameters	Runway 14 End	Runway 32 End
Primary Surface		
Total width (in feet)	500 ¹	500
Distance from centerline on each side (in feet)	250	250
Approach Surface²		
Inner width (in feet)	Not Applicable	500
Outer width (in feet)		4,000
Horizontal Length (in feet)		10,000
Slope (horizontal: vertical)		34:1
Transition Surface		
Slope (horizontal: vertical)	Not Applicable	7:1

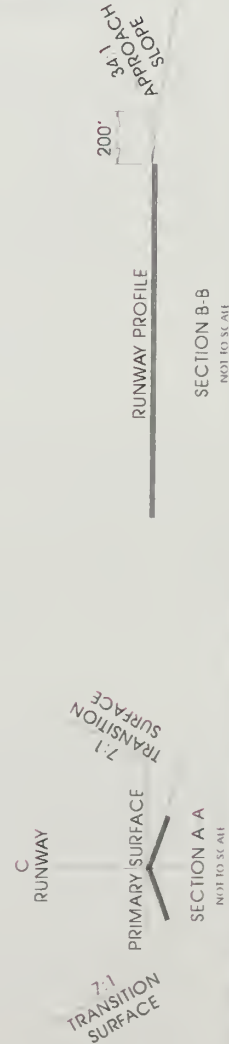
¹ Future use of a Global Positioning System for this runway could require up to a 1,000 foot wide Primary Surface (centered on the runway).

² Runway 32 end only because approaches will only be permitted to the Runway 32 end of the unidirectional runway.



LEGEND

- Conflict with Runway Safety Area/or Runway Object Free Area
- Aircraft Parking Position Eliminated Because It is in the Proposed Runway/ Taxiway OFA or RSA

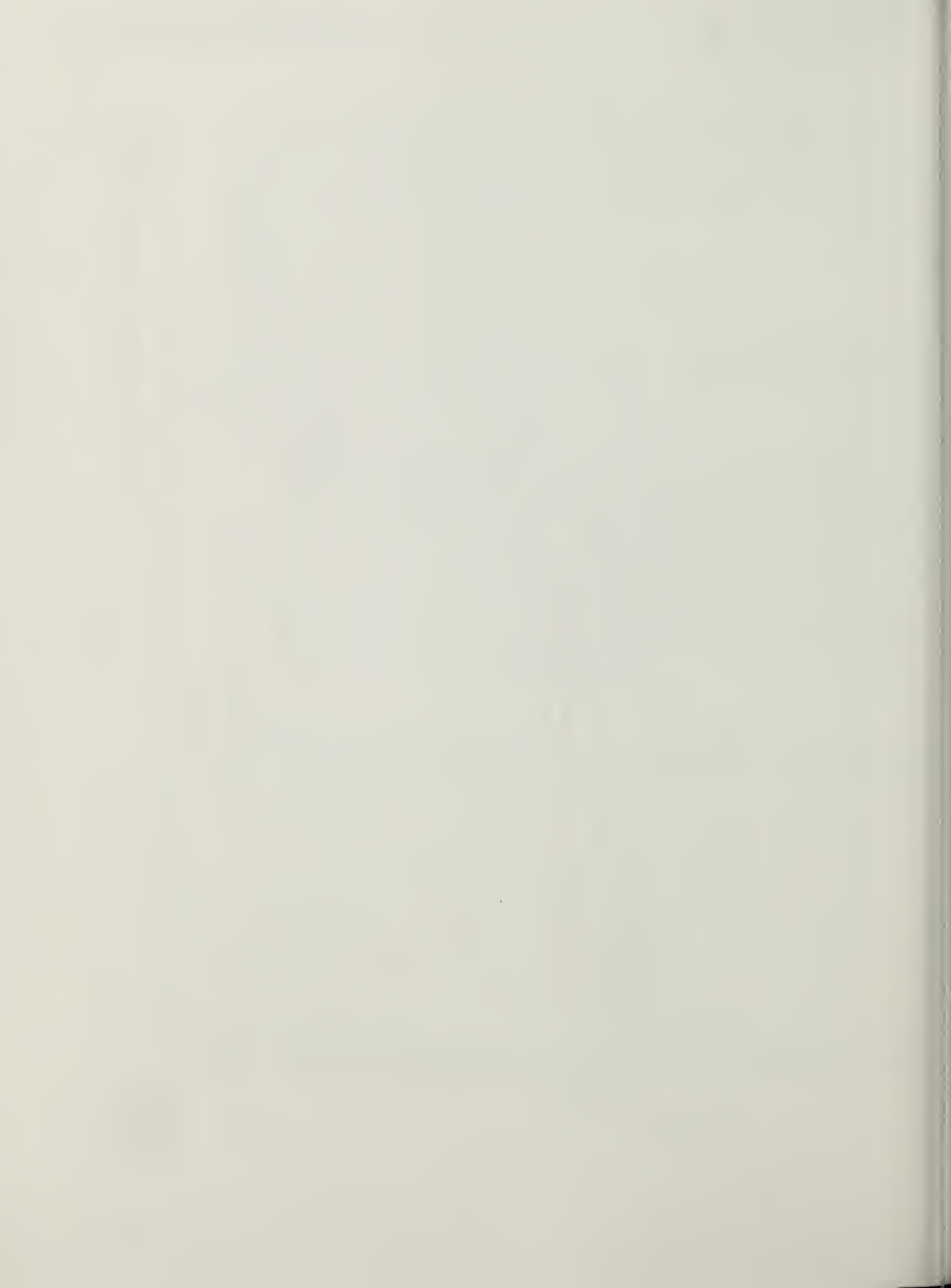


Alternatives

3-13

Figure 3.2-1

Runway 14/32 FAA Design Surfaces



A good way to visualize the shape of each of these surfaces is to imagine an oval soccer stadium, which is closed at both ends, and with the runway running down the middle of the field. The Primary Surface may be envisioned as the flat, grassy surface of the playing field, including and extending out on each side of the runway. The stadium rows behind the goal posts represent the approach surfaces. The stadium rows along the length or sidelines of the field represent the transition surfaces.

It should be noted that the location of the Hyatt Hotel precludes the use of Runway 14 for arrivals, because the hotel penetrates the Part 77 approach surface for a VFR runway.

3.2.2.2 Physical Description of Runway

Proposed unidirectional Runway 14/32 would have a length of 5,000 feet and a width of 100 feet, with 35-foot paved shoulders on either side. At either end of the runway, 1,000-foot long paved runway safety areas (RSAs) would be provided. Since the runway would only be used in one direction, no taxiway to the Runway 32 end is necessary. A small paved turnout area would be provided to allow an aborted departure to be moved off the runway and to reverse direction before returning to the terminal area.

The lighting for Runway 14/32 would include runway edge, end and thresholds lights, and Runway End Identifier Lights (REIL). These lights will be low to the ground and will be placed in accordance with FAA regulations for spacing and intensity. Because Runway 14/32 is slated to be a non-precision runway, an approach lighting system is not necessary. Markings will consist of centerline, edge line, threshold, and runway designator markings. Touchdown zone and aiming point markings would be applied for the Runway 32 end.

3.2.2.3 Runway Layout Options

Three layout options for a 5,000-foot unidirectional Runway 14/32 were developed based upon alternative treatments for the RSA on the Runway 32 end. With the exception of the RSA, each option includes identical design parameters as discussed in the previous section. Each option has been developed in sufficient detail to identify preliminary impacts, and thereby, selection of a preferred layout option. The options are designated A, B and C and are described below.

Option A

Option A, which is illustrated in Figure 3.2-2, meets all FAA runway design criteria and standards. Both runway ends have full 1,000-foot by 500-foot RSAs per the guidelines of FAA's Advisory Circular 150/5300-13 *Airport Design*. A portion of the RSA south of the runway would extend over water.

Option B

Option B, which is illustrated in Figure 3.2-3, is shifted approximately 260 feet to the east of Option A. The RSA centerline at the Runway 32 end is placed at the most easterly point of land. To accommodate the full 500-foot width of the RSA of the runway ends, a deck would be constructed or fill would be placed into Boston Harbor (affecting an area of approximately 62,000 square feet). Both runway ends would have full 1,000-foot by 500-foot RSAs, thereby meeting FAA's RSA design guidelines. A portion of the RSA south of the runway would extend over water.

Option C

The alignment of Option C is identical to that of Option B; however, a deck or fill would not be constructed. Instead, a determination of acceptance of the level of safety will be sought from the FAA for the two small, triangular corners of the Runway 32 end RSA and the portion of the RSA south of the runway, which lie over water. The revisions to the runway safety area standard can be adopted if it is determined that it will provide an acceptable level of safety. The Runway 14 end will have a standard 1,000-foot by 500-foot RSA. Option C is illustrated in Figure 3.2-4.

Based on the preliminary engineering conducted in this phase, it is expected that the FAA will agree that it is not feasible and practical (based on cost, engineering and environmental conditions) to develop the areas needed to provide a full RSA. The FAA will determine that the Runway 32 RSA would provide an acceptable level of safety.

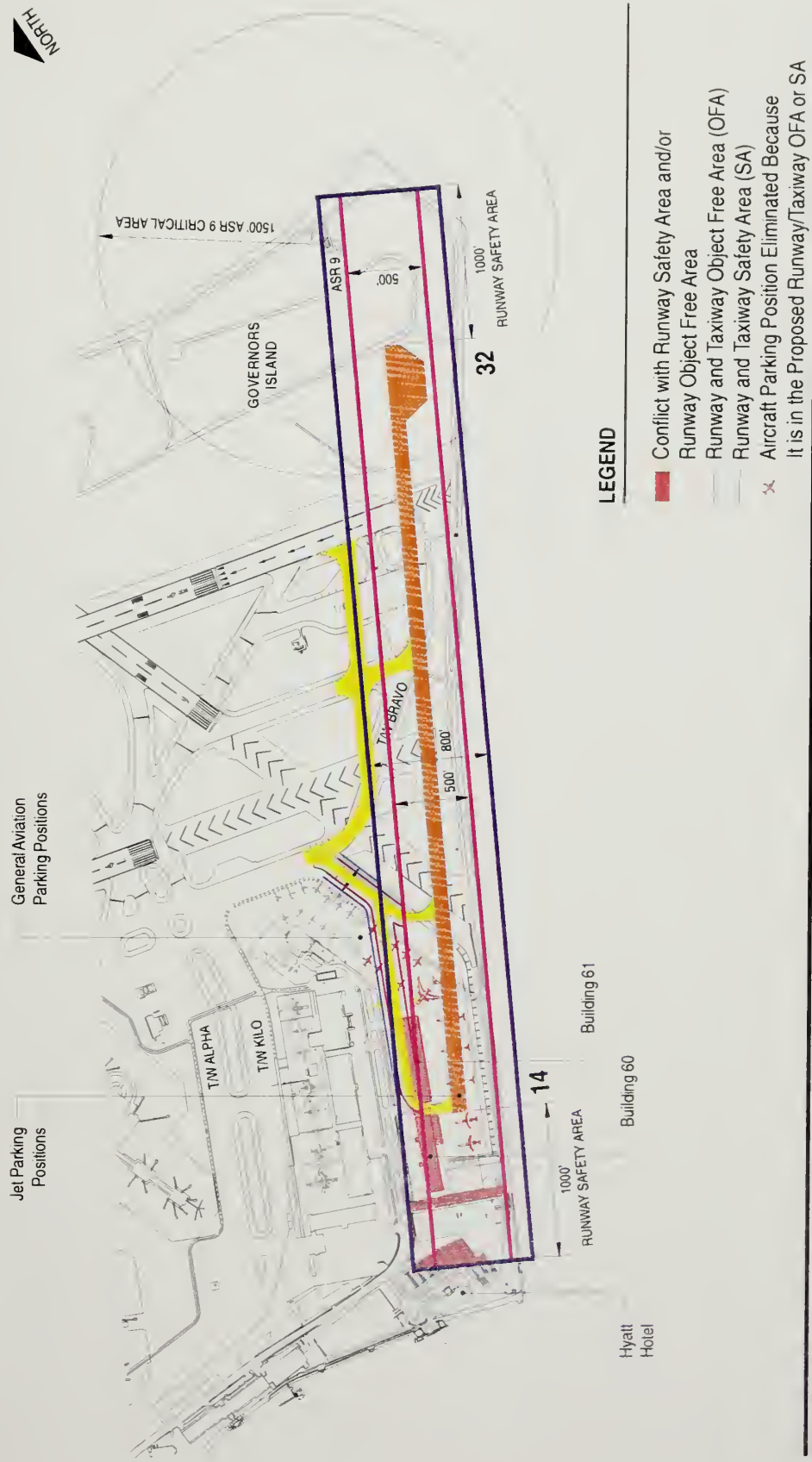
Terminal En Route Procedures

Preliminary analysis of the proposed unidirectional Runway 14/32 indicates that the FAA will be able to develop procedures in accordance with Terminal En Route Procedures (TERPs). Appropriate procedures consistent with TERPs standards for approaches and departures can and will be incorporated in the final design process for the runway.

3.2.2.4 Assessment of Technical and Environmental Issues

This section summarizes an assessment of the layout options that was conducted as part of the Airside Project Draft EIS/EIR. This assessment was performed in sufficient detail to discern relative differences among the options and to lead to the selection of a preferred design option, Option C, which was analyzed in detail in the Airside Project Draft EIS/EIR.

Technical issues were assessed by applying the FAA design criteria and standards described above. Environmental issues assessed include impacts to marine habitat in Boston Harbor, and as a general measure of environmental impacts, identification of the local, state and federal wetlands and water resources permits required. All impacts of each alternative are presented in Table 3.2-4.

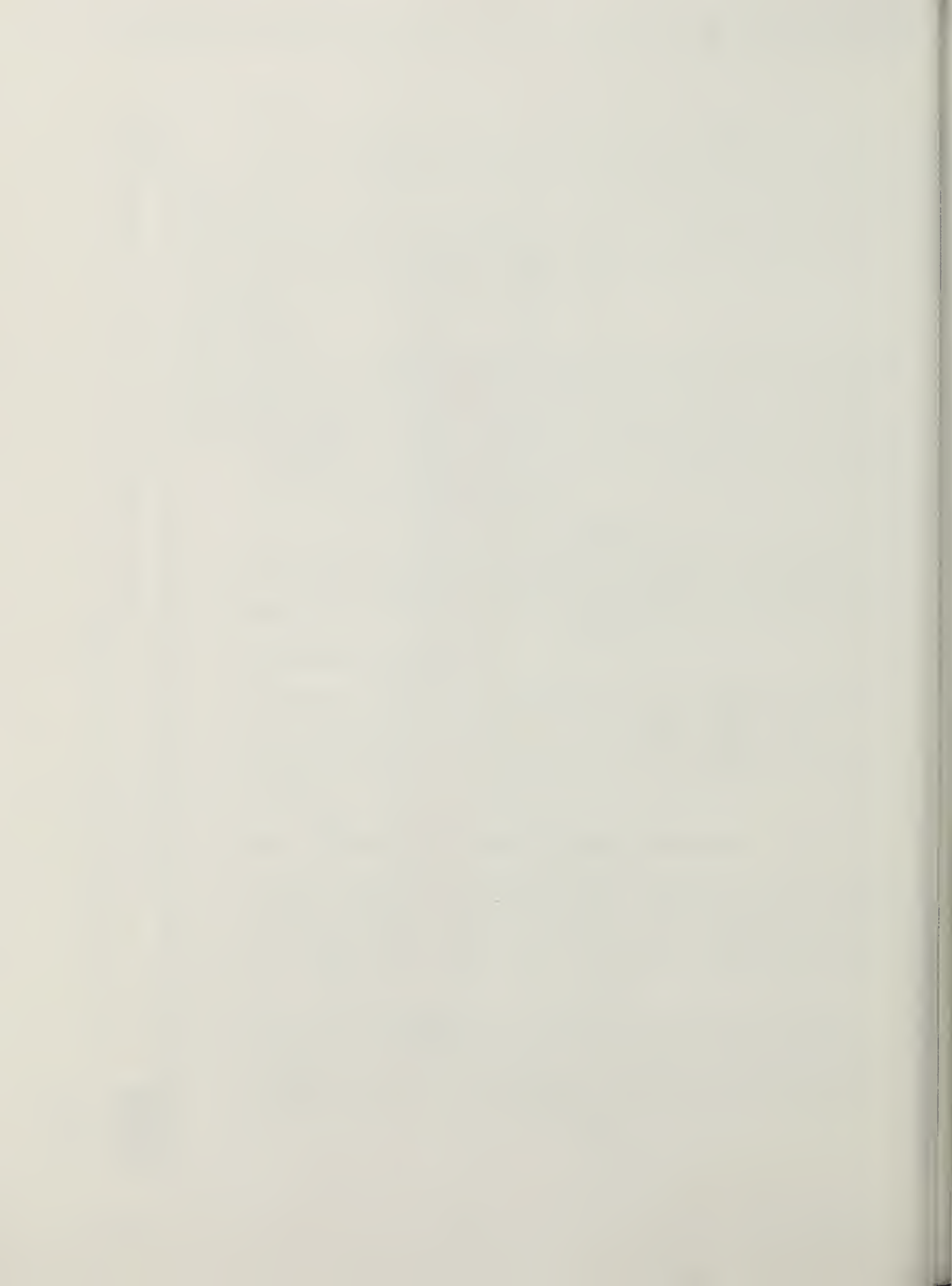


Alternatives

7465-FIG 3 2 2 p05

Figure 3 2-2

Runway 14/32 Layout Option A - Standard RSA





LEGEND

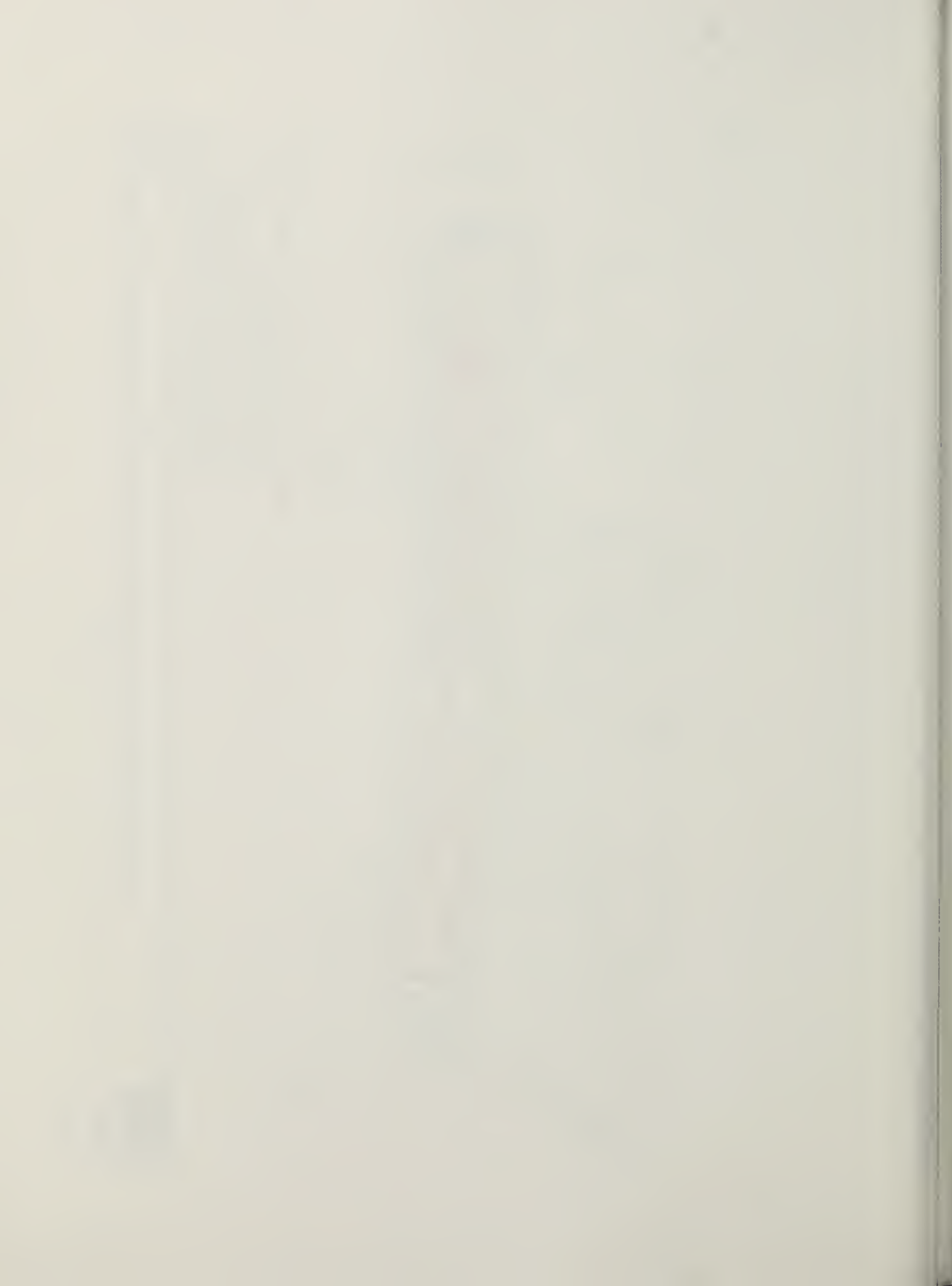
- Conflict with Runway Safety Area and/or Runway Object Free Area
- Runway and Taxiway Object Free Area (OFA)
- Runway and Taxiway Safety Area (SA)
- ✕ Aircraft Parking Position Eliminated Because It is in the Proposed Runway/Taxiway OFA or SA



Alternatives

Runway 14/32 Layout Option B - 12% of RSA Over Water with Deck or Fill

Figure 3.2-3





LEGEND

- Conflict with Runway Safety Area and/or Runway Object Free Area
- Runway and Taxiway Object Free Area (OFA)
- Runway and Taxiway Safety Area (SA)
- Aircraft Parking Position Eliminated Because It is in the Proposed Runway/Taxiway OFA or SA

Figure 3.2-4

Runway 14/32 Layout Option C - RSA Centerline on Land with Edges Over Water



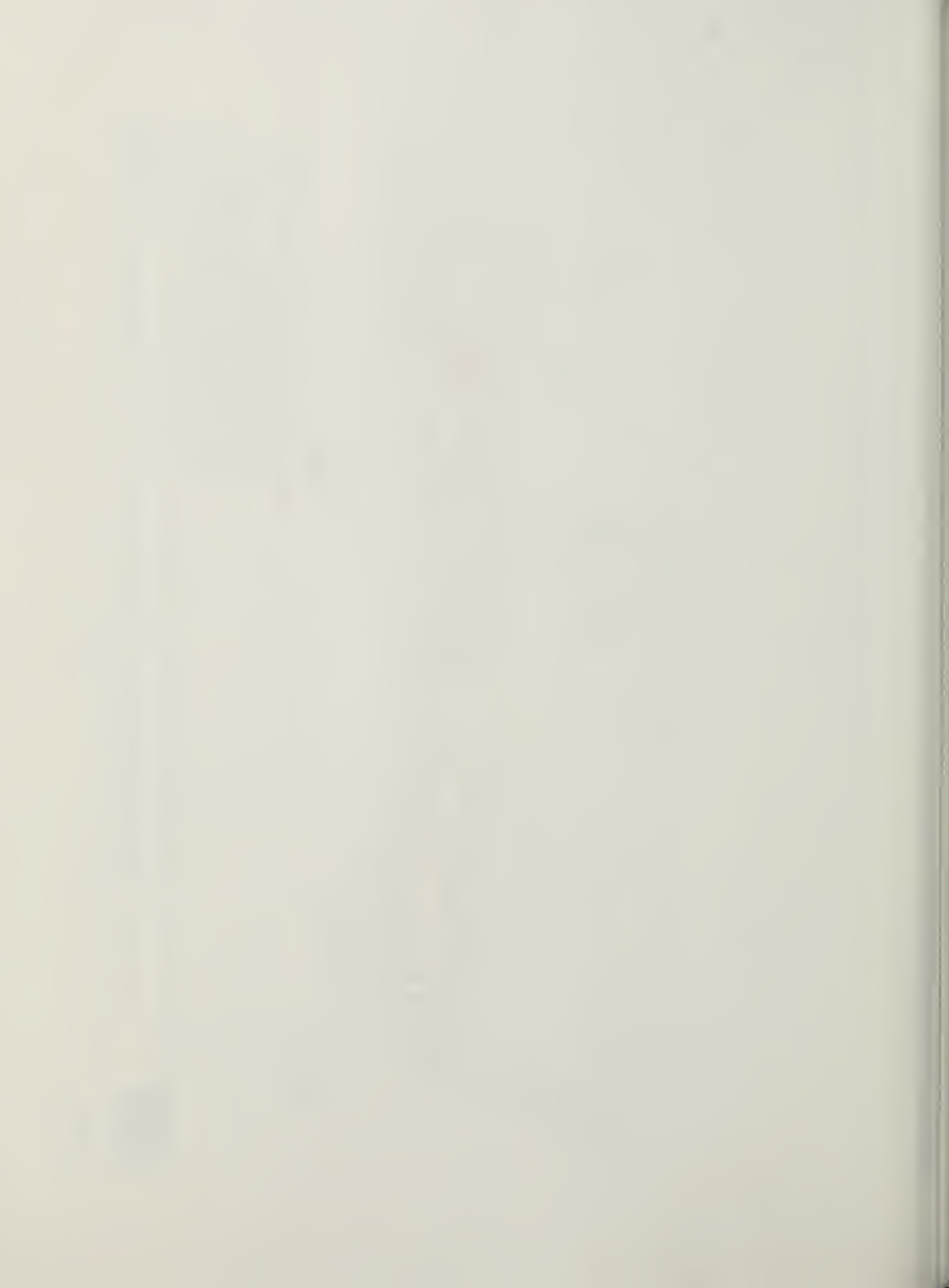


Table 3.2-4
Summary of Impacts of Runway Layout Options

Impact Type	Impact of Layout Option		
	Layout Option A	Layout Option B	Layout Option C
Building Demolition ¹	Demolish Building 60 which falls within the Runway Safety Area and Runway Object Free Area.	Same as Option A	Same as Option A
Aircraft Parking ¹	Relocate 4 jet and 8 general aviation parking positions elsewhere on the airport.	Same as Option A	Same as Option A
FAA Technical Standards ¹	Runway 14 FAR Part 77 and Taxiway Object Free Area Penetrations ³	Same as Option A	Same as Option A
FAA Technical Standards	N/A	N/A	Runway 32 Safety Area would not meet standard ⁴
Elimination of Vehicular Parking	174 spaces associated with Harborside Hyatt Hotel (71 percent of all parking at Hyatt), with no comparable relocation options.	None	None
Marine Impacts	None	62,000 square feet of deck or fill over Boston Harbor at estimated cost of \$8 million	None
Environmental Permits Required	Coastal Zone Consistency Review	Same as Option A	Same as Option A
	Order of Conditions, NPDES Permit for Construction Activities	Same as Option A	Same as Option A
	Air and Water Quality Certification from the Governor (USC 47106 (c)(1)(B))	Same as Option A	Same as Option A
		Section 404 Permit, Water Quality Certificate, Chapter 91 License	

¹ Impacts common to all three layout options.

² Building 61 is slated for demolition as part of a separate project.

³ Minimal impact with installation of obstruction hazard lights – all obstructions are located on edge of “unused” Runway 14 end (no arrivals).

⁴ Two corners totaling 12 percent of the RSA would lie over the water. A request for a determination of an acceptable level of safety will be requested from the FAA.

⁵ NPDES - National Pollutant Discharge Elimination System Permit

Impacts Common to All Layout Options

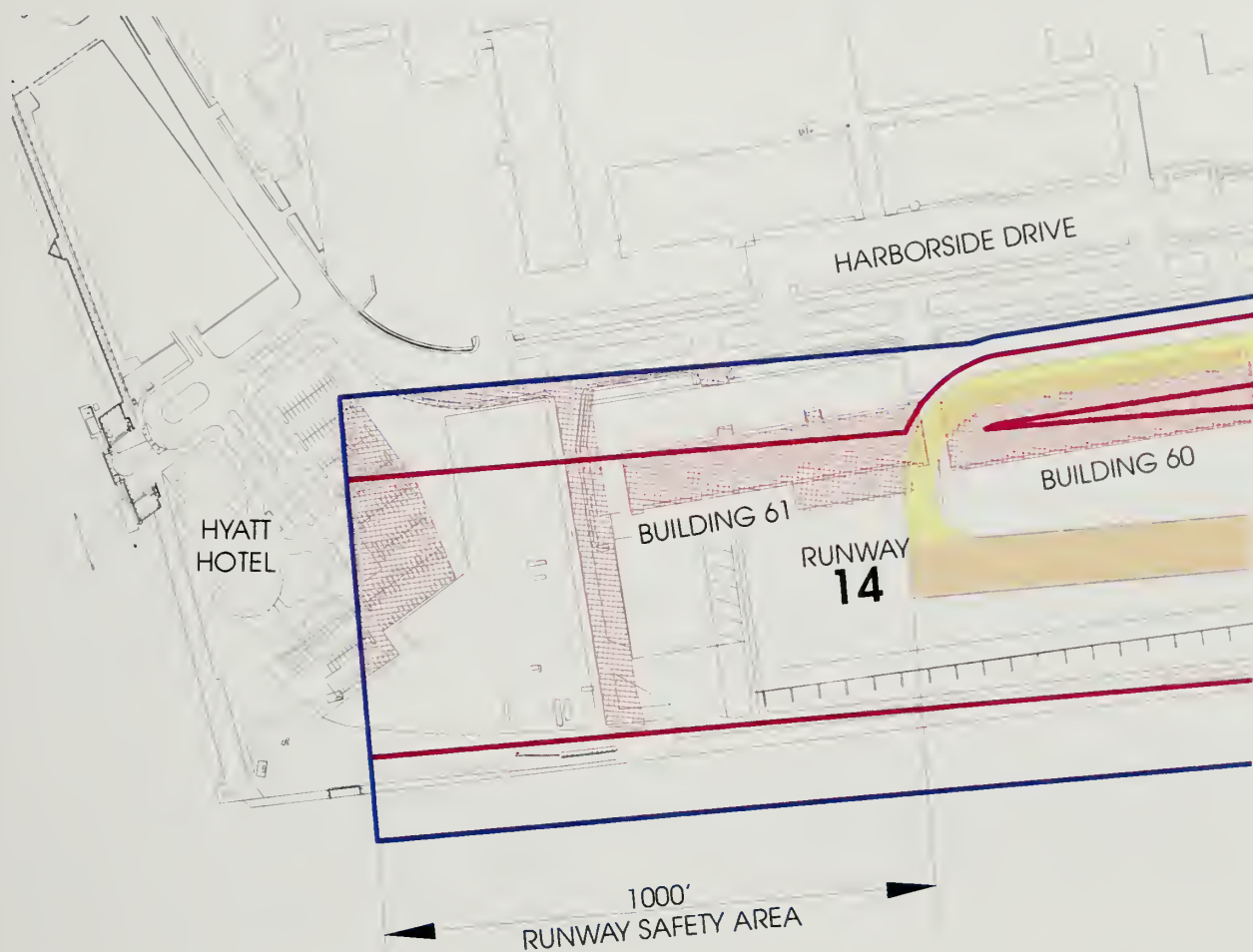
There are several technical and environmental impacts common to all three options. Since these impacts do not serve to discern relative differences between the layout options, they are listed here briefly. Section 3.2.2.4 of the Airside Project Draft EIS/EIR provides a more detailed description of these impacts.

- Two cargo buildings located off of Harborside Drive in the Bird Island Flats area, Buildings 60 and 61, fall within the RSA and ROFA of each layout option, and must be demolished; however, Building 61 is planned to be demolished as part of another project and therefore is not an impact of Runway 14/32. (see Figure 3.2-2)
- Four jet parking positions and eight general aviation daytime positions near Building 60 must be relocated elsewhere on the airport (see Figure 3.2-3).
- Harborside Drive falls within the edge of the FAR Part 77 Primary Surface and a corner of the ROFA at the Runway 14 end. Vehicles traveling on Harborside Drive would intrude on these areas. In addition, the Hyatt Harborside Hotel (Hyatt) and Buildings 56 and 57, located to the northeast of Harborside Drive, penetrate the FAR Part 77 Transition Surface. All of these obstructions are located on the edge of the Runway 14 end that will not be used for arrivals. In accordance with FAA regulations, obstruction hazard lights will be installed on the buildings.
- A portion of the RSA to the south of the runway would extend over the water (approximately 86,000 square feet). The FAA has conducted preliminary analysis of the RSA along the south side of the runway and has concluded that they would be able to make a determination that it provides an acceptable level of safety.
- Permit requirements include an Order of Conditions from the Boston Conservation Commission and a National Pollutant Discharge Elimination System (NPDES) permit for construction activities from the US Environmental Protection Agency (EPA)/MA Department of Environmental Protection (DEP).

Impacts Specific to Individual Layout Options

Option A

Option A places Runway 14/32 furthest to the west of the options under consideration and would eliminate 174 parking spaces associated with the Harborside Hyatt Hotel, at the Runway 14 end. Of the 174 affected spaces, 162 spaces are directly impacted, since parking is not allowed within the RSA and the Runway Object Free Area (ROFA). Twelve additional spaces would be lost as a result of reconfiguring driveways to maintain access to existing spaces. The 174 lost spaces represent 71 percent of the existing 241 spaces at the Harborside Hyatt (see Figure 3.2-5). No comparable relocation options exist. Consequently, acquisition of the affected 174-parking space area by negotiation is highly unlikely and acquisition by eminent domain would likely not be resolved without costly and protracted litigation.

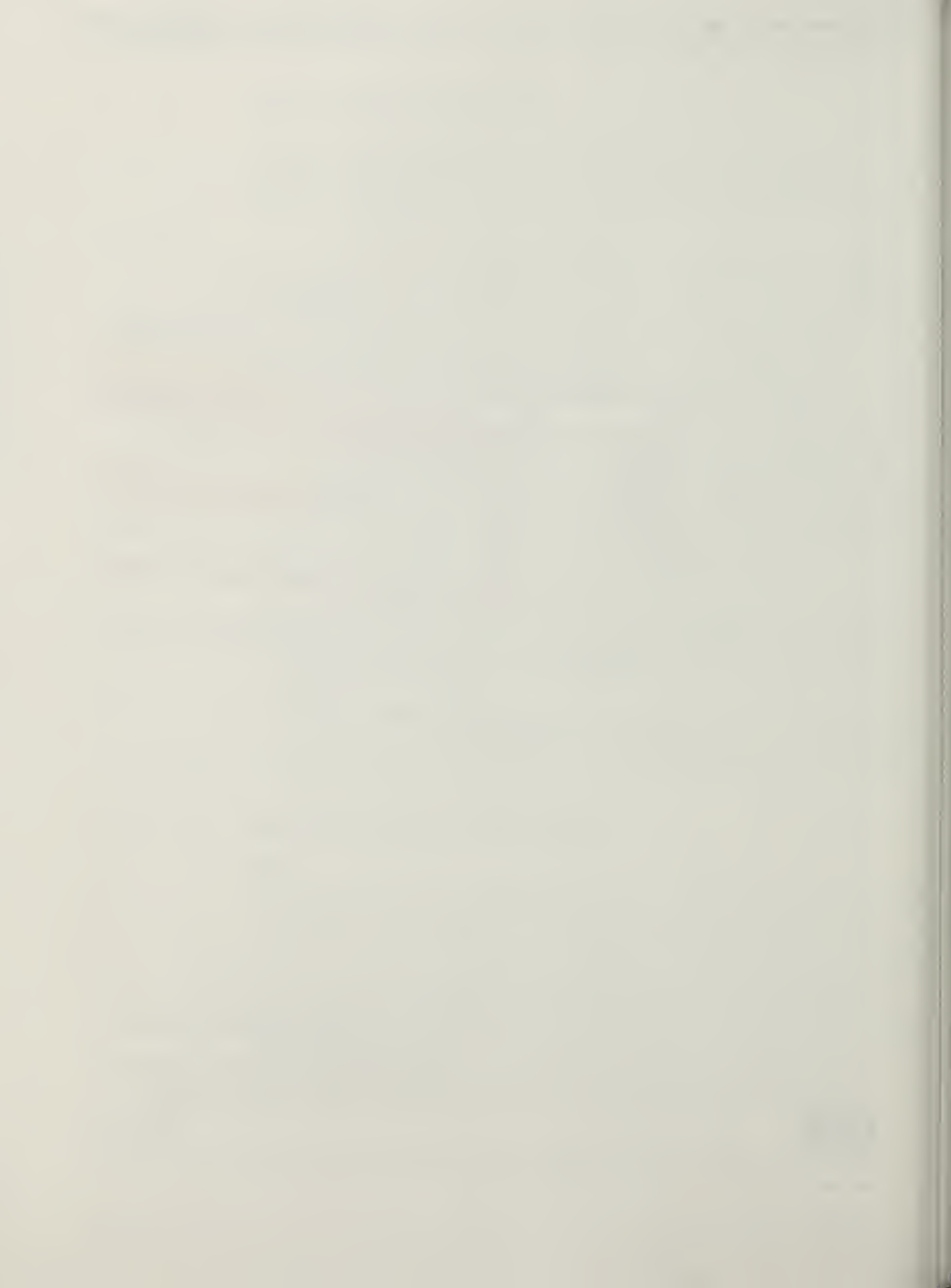


LEGEND

- Conflict with Runway Safety Area and/or Runway Object Free Area
- Runway and Taxiway Object Free Area (OFA)
- Runway and Taxiway Safety Area (SA)



Figure 3.2-5
Runway 14/32 Layout Option A - Potential Impacts to Parking Associated with the Hyatt



While no modification of FAA standards for the Runway 32 end RSA is required by this option, the impacts on the Hyatt and related costs could potentially be avoided through a modification of RSA and ROFA standards.

Option B

Option B shifts the runway and RSA 260 feet to the southeast (i.e., further away from the Harborside Hyatt) to avoid the Hyatt Hotel's parking lot. As a result, the outer corners of the Runway 32 end RSA are pushed out over the water. Option B includes construction of a deck over the water or fill that covers approximately 62,000 square feet of the harbor, in order to provide the full safety area on the Runway 32 end. Preliminary cost estimates indicate that a deck would cost approximately \$8 million (1996 dollars).

The deck or fill may generate direct impacts to marine life and indirect impacts due to the loss or alteration of intertidal habitat. This activity would require the following environmental permits: U.S. Army Corps of Engineers Section 404, Coastal Zone Consistency Review, Water Quality Certificate, Chapter 91 license, NPDES permit, and an Order of Conditions from the Boston Conservation Commission. In addition, since this options requires work in the Harbor, a "Reasonable Assurance letter for Water Quality" from the Governor of the Commonwealth would be required.

Option C

Option C has the identical layout/alignment as Option B, except that no structures would be constructed to accommodate the two small corners of the Runway 32 RSA that lie over the water. Instead, a determination of an acceptable level of safety, would be requested from the FAA. The two corners represent approximately 12 percent of the full RSA area at the Runway 32 end.

In considering a determination, the test is whether an acceptable level of safety can be maintained with the proposed conditions. Three factors are considered:

- An analysis of aircraft accident locations off runway ends based on national statistics;
- The types of aircraft reasonably expected to operate on the runway; and,
- The conditions of use and practical constraints for the runway RSA based on environmental, physical, or cost factors.

Based on an evaluation of these factors, which is discussed in detail in Section 3.2.2.4 of the Airside Project Draft EIS/EIR, the proposed determination for the Runway 32 RSA will not compromise safety because:

- The proposed Runway 32 RSA is a full 1,000 feet long on the centerline.
- The NAVAIDS to be installed would provide added glide path and alignment guidance in Instrument Meteorological Conditions (IMC).

- Available statistical data show that the small over-water corners of the RSA will not significantly affect the safety of operations to Runway 14/32, even for larger group C-III aircraft.¹¹ Historically, reported undershoots under the conditions for which Runway 14/32 would be used have been on the centerline and within 1,000 feet of the Runway.

The FAA has conducted a preliminary analysis of the RSA on the southeast (Runway 32) end and along the south side of the runway, and has concluded that it would be able to issue a determination that it provides an acceptable level of safety.

3.3 Taxiway Improvements

Four proposed taxiway improvements are described in this section. For each taxiway, the purpose and general effects of the improvement on Logan's airfield operations are summarized. All four of the taxiway improvements would be included in each of the build alternatives: Alternatives 1 and 1A, which include Runway 14/32, and Alternative 2, which does not include Runway 14/32. Each of the taxiway improvements would improve Logan's airfield efficiency, with or without Runway 14/32. Each proposed taxiway has a paved width of 170 feet, which includes a 100-foot wide taxiway and two 35-foot paved shoulders.

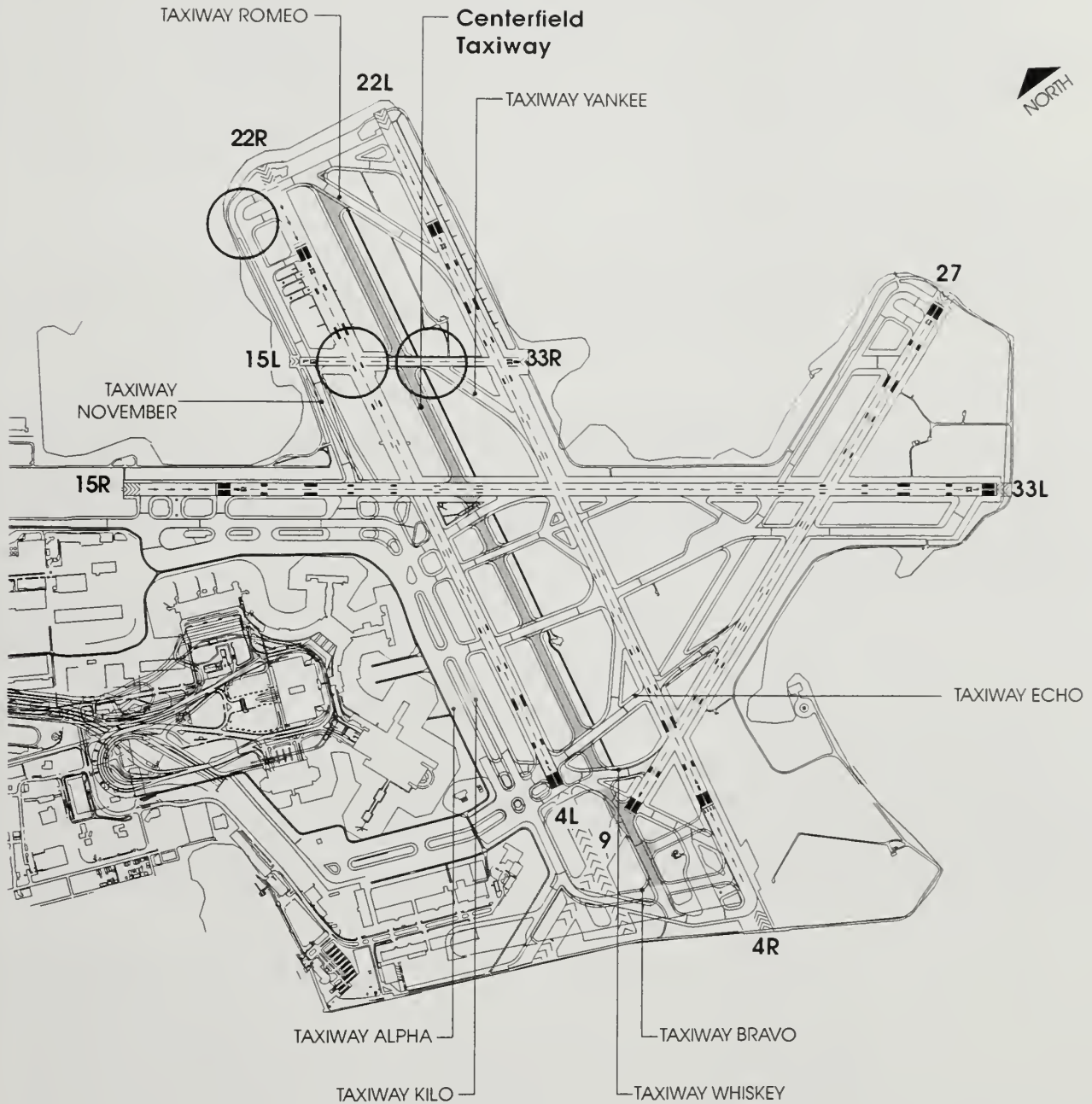
3.3.1 Centerfield Taxiway

A new 9,300-foot Centerfield Taxiway would be located between Runways 4L/22R and 4R/22L, as shown in Figure 3.3-1.¹² The purpose of the Centerfield Taxiway is to provide alternative taxi routings for more efficient movement of aircraft between runways and terminal areas. Improved taxi routes will reduce ground delays for both arriving and departing aircraft. By diminishing delays, particularly north of Runway 15R/33L, the Centerfield Taxiway would reduce both ground noise and air quality impacts associated with ground operations. The Centerfield Taxiway would also alleviate congestion in the vicinity of Terminals B and C, and it would enhance the general safety of airside operations. Specifically, a Centerfield Taxiway would have the following operational benefits:

- **Reduce taxiing delay for Runway 4R arrivals.** Instead of queuing on Runway 33R to cross Runway 4L and then all taxiing single-file down taxiway November, many aircraft could immediately proceed southbound between the runways and then cross Runway 4R at one of several taxiways nearer their gates.

11 DOT/FAA/DOV 90-1 "Location of Commercial Aircraft Accidents/Incidents Relative to Runways," FAA Office of Safety Oversight, July 1990.

12 A Centerfield Taxiway, positioned between Runways 4L/22R and 4R/22L, was initially proposed in 1990 as part of Massport's annual airfield improvements program. An ENF was filed for that program and a Scope for a Draft EIR was issued by the Secretary of the EOE, pursuant to MEPA. That project (EOEA No. 8108) was later withdrawn by Massport. The layout of the Centerfield Taxiway concept as proposed in this Supplemental Draft EIS/FEIR differs from the 1990 proposal in that the current proposal extends south to Taxiway Bravo to incorporate reconfiguration of the Southwest Corner taxiway system (see Section 3.3.2). The earlier concept terminated at Taxiway Whiskey.



LEGEND

- Proposed Taxiway
- Existing Congestion Points



Figure 3.3-1
Centerfield Taxiway

- **Reduce taxiing delays for Runway 22L departures.** Currently, aircraft needing the greater departure length of Runway 22L must queue up on Taxiway November with the rest of the departures using Runway 22R. This causes delays for aircraft using both runways during heavy traffic periods. The Centerfield Taxiway would permit the Runway 22L departures to cross Runway 22R near the terminals and proceed directly to the runway, where they would be ready for takeoff as soon as a gap occurs in the Runway 22L arrival stream. Although some comments have argued that this would increase the “stacking” of aircraft in the northern section of the airfield, it would in fact reduce the total delay experienced by both Runway 22R and 22L departures.
- **Decrease taxiing delays for Runway 22L and Runway 27 arrivals.** Similar to the Runway 4R arrivals discussed above, the Centerfield Taxiway would enable many of these arrivals to proceed northbound to a taxiway nearer their gate, and then several could cross Runway 22R simultaneously.
- **Ease congestion near Terminals B and C.** Due to its proximity to these terminals, aircraft using Taxiway Alpha are frequently delayed by aircraft entering or leaving their gates in this area. This congestion would be reduced by using parallel paths on Taxiway Kilo and the Centerfield Taxiway instead of Kilo and Alpha, thereby freeing Taxiway Alpha for pushbacks.
- **Reduce the potential for wing-tip clearance conflicts on Taxiways Alpha and Kilo.** The large wingspan of the newer generation of heavy jets prevent them from passing on the closely spaced taxiways Alpha and Kilo. Using Taxiway Kilo and the Centerfield Taxiway would avoid such problems.

The Centerfield Taxiway would not change the total number of aircraft operations which cross an active runway, but it would substantially reduce the delays experienced by these aircraft, particularly for arrivals. Instead of forming a single queue to cross Runway 4L/22R single-file, they could be dispersed to multiple crossing points where several could cross the active runway at the same time.

In general, a Centerfield Taxiway would decrease taxiing distances and taxiing times for most airfield operating configurations, and would also move points of congestion away from residential areas. The Taxiway would reduce the potential for runway incursions, would enhance safety by decreasing congestion on the taxiway system, and would provide controllers with greater flexibility to improve the efficiency of airport ground operations.

3.3.2 Southwest Corner Taxiway System Reconfiguration

Changes to the taxi layout in the Southwest Corner of the airport near the ends of Runways 4L, 4R and 9 will simplify a confusing jumble of taxiways, reduce the opportunities for runway incursions, and expedite ground movements in this area. Reconfiguring the existing taxiways will improve the access of departures to Runways 4L, 4R and 9, and will provide a more logical and streamlined flow for inbound and outbound aircraft when Runways 27 and 33L are active (see Figure 3.3-2).

The Southwest Corner reconfiguration would enhance safety and operating efficiency by simplifying runway crossings and access in a section of the airfield that may be confusing to some pilots, particularly at night or during reduced visibility. It would also allow Runway 14/32 to be used as a taxiway in some runway configurations to improve flexibility and ground movement efficiency.

3.3.3 Taxiway Delta Extension

Taxiway Delta would be extended 2,000 feet between Taxiway Charlie and Runway 4R/22L (see Figure 3.3-3). The completion of Delta would provide an alternate path for departures on Runways 27 and 33L, thereby reducing congestion on Taxiway Charlie that now is the sole access to these runways. This would improve efficiency by separating jets taxiing to Runways 27 and 33L from non-jets using Taxiways Charlie and Golf for Runway 33L intersection departures.

3.3.4 Taxiway November Realignment

Approximately 2,200 feet of Taxiway November would be realigned between Runway 15L/33R and Runway 15R/33L to simplify its connection to Taxiways Kilo and Alpha which provide the main flow around the terminal areas (see Figure 3.3-4). In addition, this improvement would eliminate the confusing simultaneous intersection of Taxiway Tango with both Runways 33L and 22R. These changes would not only improve efficiency but also enhance safety by reducing the potential for runway incursions, especially at night and during reduced visibility.

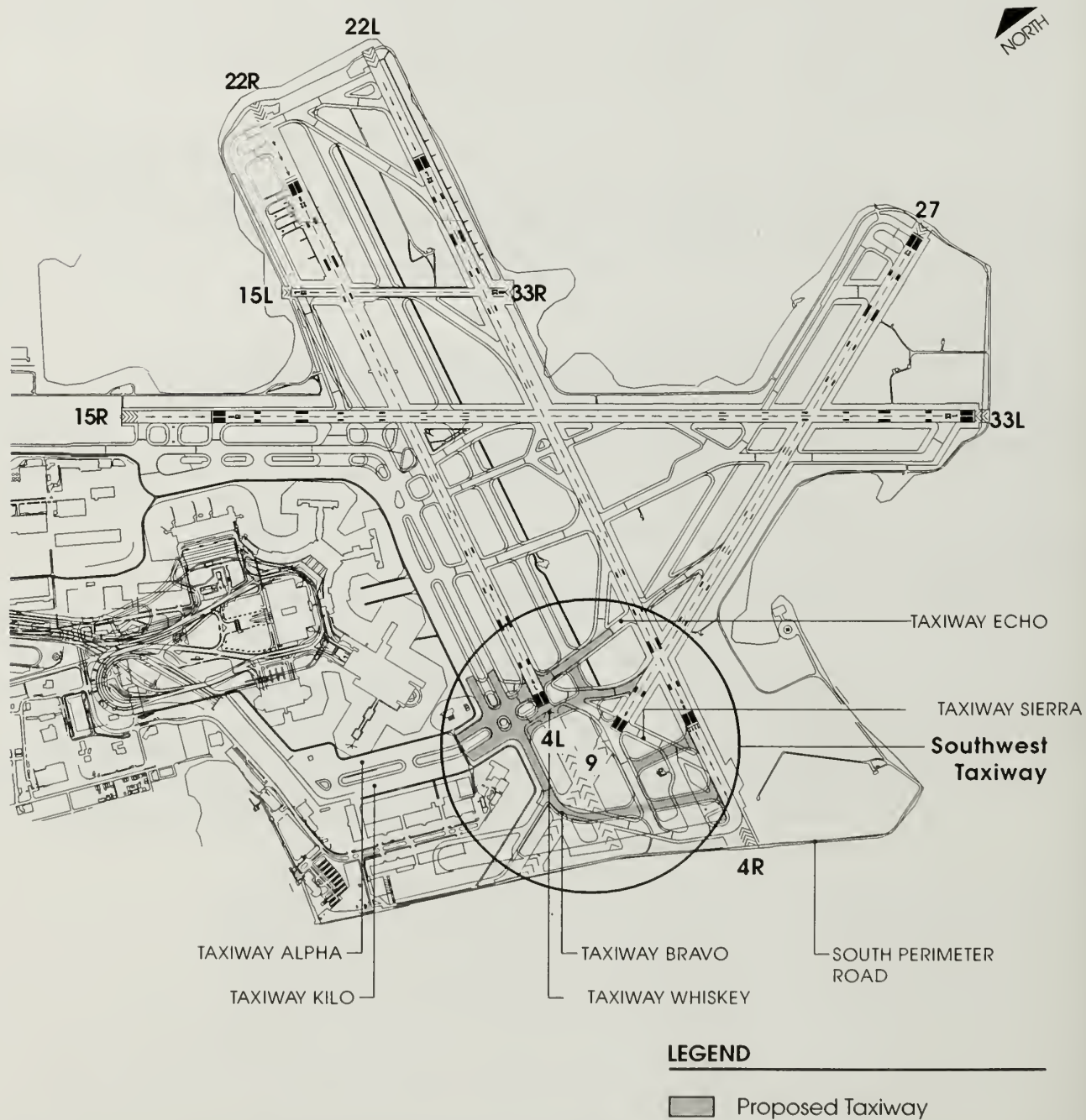
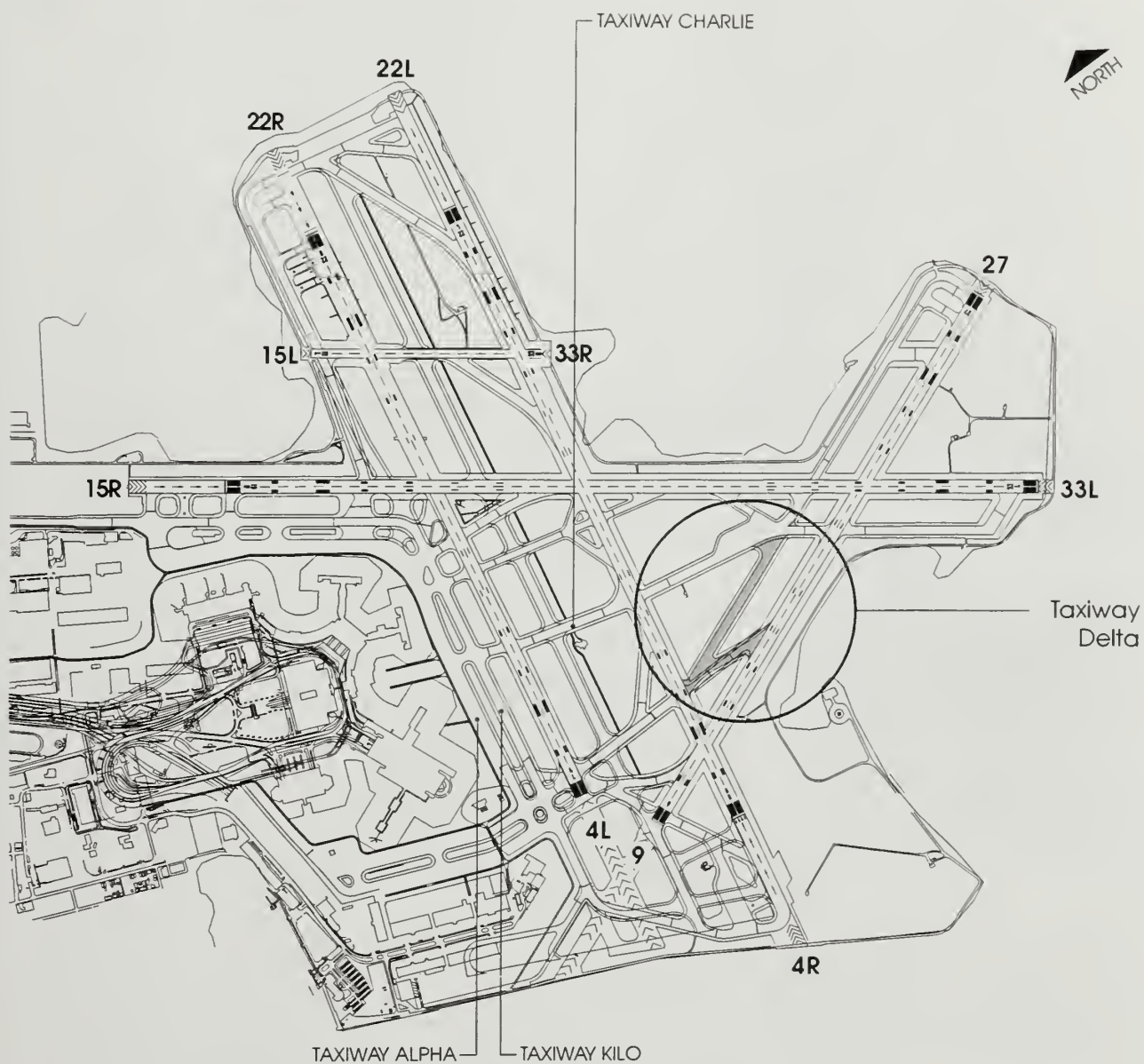


Figure 3.3-2
Southwest Taxiway System Reconfiguration



LEGEND

 Proposed Taxiway



Figure 3.3-3
Taxiway Delta Extension

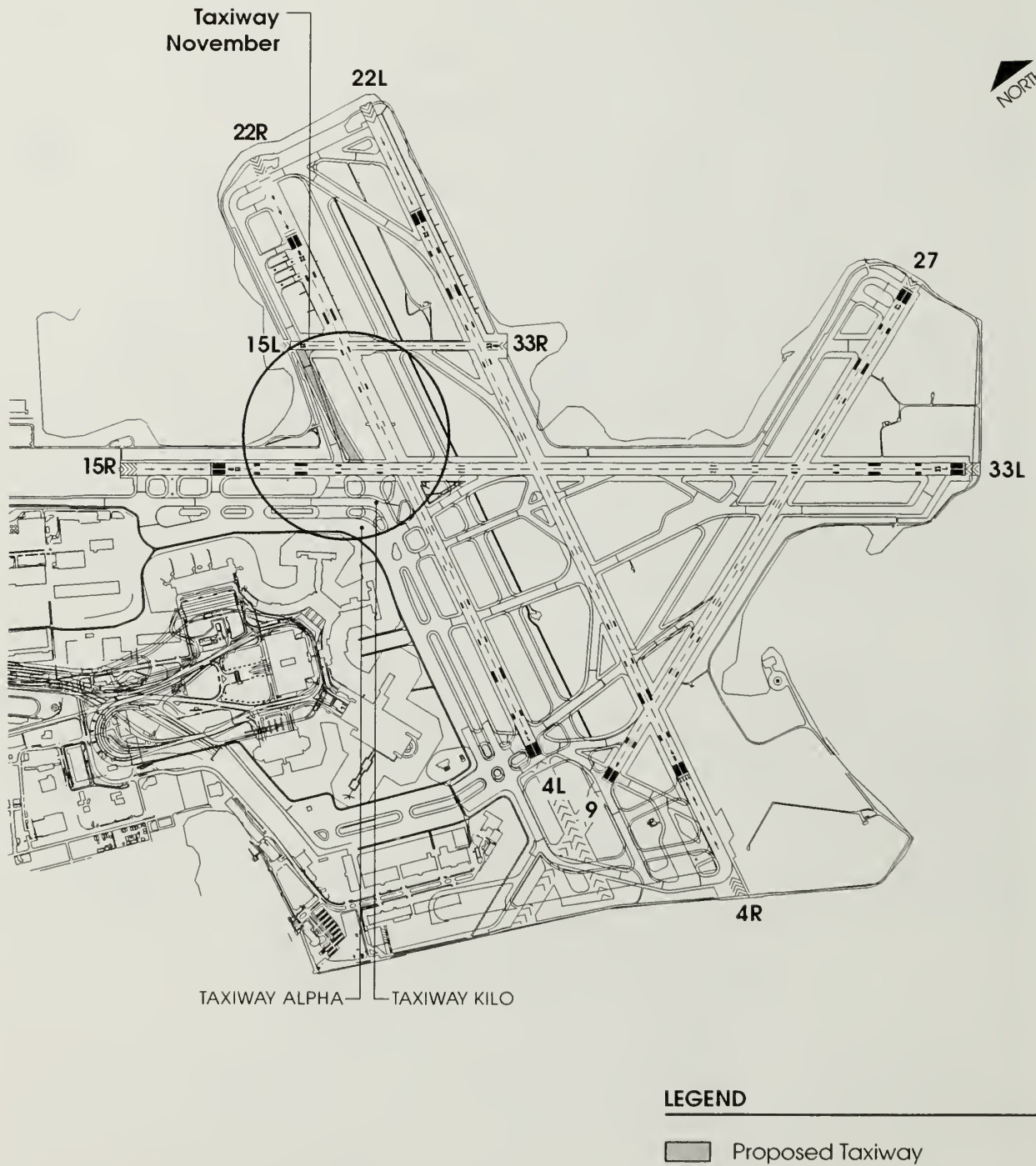


Figure 3.3-4
Taxiway November Realignment

3.4 Reduced Approach Minimums for Runways 15R, 22L, 27, and 33L

This improvement concept proposes to reduce the current approach minimums on four existing runways at Logan to FAA values which are provided at most other airports in the nation. The "approach minimum" is the lowest point along the existing glide slope during the approach (landing) at which the pilot must make a decision whether to land or to execute a missed approach procedure, when the visibility is low. The approach minimum for each runway is established by the FAA based upon the type of navigation equipment available, the existence of obstacles in the approach area, and performance of the aircraft. The approach minimums are established and published for each runway by the FAA. Lowering the minimums would not change the altitudes at which aircraft operate, but just the distance from the runway where the missed-approach decision is made.

Five of Logan's runway ends are equipped with precision electronic navigation systems (Instrument Landing Systems - ILS) and approach lighting systems, which enable aircraft to land under low visibility weather conditions. At the present time, only Runway 4R, which is equipped with a Category III ILS, is approved for the lowest approach minimum established by FAA. This adds to greater use of and dependence on Runway 4R under poor weather conditions. This section summarizes proposed changes to the approach minimums at the other four runways, which are also described in Section 3.4 of the Airside Project Draft EIS/EIR.

Although Runways 15R, 22L, 27 and 33L are each equipped with a precision Category I ILS, those on Runways 22L and 27 currently have approach minimums that are artificially constrained and are significantly higher than the capabilities of the existing electronic equipment permit. When the ILSs were installed on Runways 22L and 27 several years ago, the FAA agreed to retain the existing non-precision approach minimums until the appropriate new values could be addressed in an EIS. Reduction of the approach minimums on Runways 22L and 27 to ILS Category I values that are consistent with current FAA standards is included in all improvement alternatives. The existing and proposed ILS minimums are shown in Table 3.4-1.

The existing ILS approaches to Runways 15R and 33L are also proposed to be improved. The planned action includes upgrading these approaches to Category III ILSs, which would permit landings on these runways down to the same approach minimums as on Runway 4R. The availability of additional precision navigation equipment on these two runways would provide improved operational flexibility to air traffic controllers and enhance safety during adverse weather conditions.

Lowered minimums on these four runways would extend the range of weather conditions under which they could be used and would thereby reduce reliance on Runway 4R during low visibility. This would provide improved operational flexibility and thereby reduce delays as well as increase the opportunity to achieve PRAS goals, particularly the short-term dwell and persistence.

Table 3.4-1
Existing and Proposed ILS Minimums* for Runways 15R, 22L, 27, and 33L

		Cloud Ceiling		Visibility	Distance of Decision Height Point from Touchdown		Runway Availability
Runway		Feet Above Ground Level	Mean Sea Level Elevation (feet)	Statute Miles	Feet	Nautical Miles	Annual Hours, 1980 – 1990 Weather
15R	Existing	250	268	3/4	4,800	0.79	5,356
	Proposed	0	18	1/8	0	0.00	5,495
22L	Existing	403	420	1-1/4	7,700	1.27	6,835
	Proposed	200	217	1/2	3,800	0.63	6,929
27	Existing	443	460	1-1/2	8,500	1.39	6,972
	Proposed	200	217	1/2	3,800	0.63	7,055
33L	Existing	200	217	1/2	3,800	0.63	7,173
	Proposed	0	17	1/8	0	0.00	7,249

* Lowest minimums possible. Some may be gradually achieved.

Table 3.4-1 shows the change in availability of each runway due to reduced minimums. An analysis of the 37.5M Low Fleet demonstrated that reduced minimums alone provide an annual delay reduction of approximately 6,000 hours as a result of greater runway availability under poor weather conditions. Appendix D of the Airside Project Draft EIS/EIR provides additional discussion of reduced minimums and their associated delay benefits.

3.5 Peak Period Pricing

Peak Period Pricing is a demand management tool that is intended to reduce delays caused by situations where flight demand exceeds airfield capacity over a sustained period. Peak Period Pricing works by raising the price of using the airfield during designated peak hours. As a result, some existing aircraft operations would be discontinued if the cost of using Logan during the peak would exceed the value of the economic return to the carrier.

Peak Period Pricing was chosen from alternative demand management strategies because it has been effective in other industries and because it is excluded from review under Part 161 of the Federal Aviation Regulations, which sets standards for airports that wish to restrict access for Stage 3 aircraft. Other demand management tools, such as slots or caps, are discouraged under current federal guidelines and would require extensive analysis under Part 161. The current environment where Congress has moved to eliminate slots at High Density Airports suggests that imposing slot controls would not be approved.

Current flight activity levels at Logan do not exceed available airfield capacity during VFR conditions. Airline overscheduling has not been a significant cause of delays at Logan since 1993. Nonetheless, the effect of Peak Period Pricing on delay was evaluated for its potential to reduce delay under future conditions should airline overscheduling re-emerge.

Chapter 3 of the Airside Project Draft EIS/EIR provided descriptions of previous Logan programs, the procedural requirements for implementing Peak Period Pricing, and the screening analysis used to determine the Peak Period fee that was tested across all future fleet scenarios. This section discusses alternative demand management practices, their use at other airports, and previous initiatives at Logan.

3.5.1 Demand Management Policies at Other Airports

The FAA requested that the Supplemental Draft EIS/Final EIR identify demand management strategies that are in use or have been proposed by other airports. Presently there are few examples of demand management policies employed at other United States airports. The most notable example of demand management in the United States was the imposition of slot restrictions at several of the nation's most congested airports in 1969.

Demand management techniques can be generally classified as either regulatory or economic. The former establishes a limit on the number of flights that can be accepted at an airport, i.e., slots, while the latter charges airfield users a higher fee during the busiest periods in order to reduce demand. Sometimes a combination of the two is employed.

3.5.1.1 Regulatory Approaches

These are the most common techniques used by airports worldwide to control airport demand, but have seen relatively limited application in the United States. In the United States, under FAA guidelines, a regulatory approach would be construed as an airport access restriction, and would therefore require an airport to conduct a Part 161 Study.

Slots

Most of the world's major international airports outside the United States use slot controls to limit traffic to an acceptable level. The slots are negotiated by a Slot Committee which meets periodically to review and revise the allocation of landing slots at the major airports. Each participating airport is represented on the committee, often by the home country's flag carrier. The number of slots for a given airport is set by the airport management or local government authority, and a prescribed number are usually reserved for the local carriers.

In the United States, slots are used at only four High Density airports (Chicago O'Hare, Washington Reagan National, New York JFK and New York LaGuardia). The number of slots per hour is set by the FAA for air carriers, commuter operators and general aviation. At LaGuardia, for example, access was restricted to 68 hourly operations between 6:00 A.M. and midnight. Of these, 48 were allocated to air carriers, 14 to commuter carriers,

and six to charter operators, general aviation, military, or airline extra-section operations. Until the passage of slot reforms in April 2000, the number of slots has changed only slightly at these airports since the program commenced in 1969.

Passenger Caps

This method is used occasionally in the United States, generally at smaller airports. It can restrict the annual volume, or set a short-term (e.g. half-hourly) limit on passengers carried. Examples include Orange County in California and Westchester County in New York.

Perimeter Rules

This technique controls demand by placing a limit on the originating or destination airports that can be served from the constrained airport. Washington Reagan National and New York LaGuardia are the primary examples of perimeter rules in the United States. These perimeter rules pre-dated Part 161 requirements.

Gate Use Standards

This method attempts to maximize airfield efficiency by placing a limit on the number of daily seats that a carrier operates through each gate. It is implemented via the airport-airline lease agreement, and forces the carrier to use the gate for its most valued flights and usually larger aircraft. Chicago Midway is a successful example of this approach in operation. Seattle-Tacoma Airport considered this program in 1995, but eventually dropped it due to complications with existing long-term lease agreements.

Aircraft Size Limits

This approach is similar to the gate use standards, but explicitly limits the minimum seat-size of aircraft using the airfield to increase efficiency. It was recently proposed at San Francisco to reduce weather-related delays for flights to/from Western United States cities, but a formal policy was never implemented.

3.5.1.2 Economic Approaches

These methods apply higher fees for flights operating during the peak periods to use the law of supply and demand for controlling activity. The concept often applies differential pricing for different types of users, and usually changes the fee structure by time of day. Several examples are provided below.

London Heathrow

Heathrow Airport has implemented a flat fee per operation (no traditional weight-based landing fee) during peak hour operations for several years. The fee is higher during the hours from 7:00 to 10:59 A.M. and 5:00 to 7:59 P.M. during the summer season. During the off-peak hours, two weight-based aircraft categories are used to calculate landing fees.

New York Minimum Landing Fee / GA Surcharge

In August 1968, the Port Authority of New York and New Jersey (PANYNJ) instituted a minimum landing fee on general aviation during peak periods at the three New York airports. The minimum fee for GA operators was progressively increased and eventually changed to a \$100 surcharge (in addition to the traditional weight-based fee). The same minimum fee was subsequently imposed on commuter operators.

Boston Logan Minimum Daily Landing Fee

In 1982, Massport implemented a minimum daily landing fee of \$50, applied against the conventional weight-based fee from 8:00 A.M. to 8:00 P.M.. The effect of the minimum was to discourage individual GA flights without penalizing multiple daily flights by small commuter/air taxi operators. Resistance to this program was strong, however, and in less than a year Massport rescinded it.

Boston Logan PACE Program

In July 1988, Massport implemented the Program for Airfield Capacity Efficiency (PACE). PACE represented a modification to Logan's landing fee structure that redistributed costs between users, while maintaining revenue neutrality (i.e., maintaining total airfield revenues at a level that does not exceed total airfield costs). The landing fee formula was changed to include a \$91 fixed cost per landing plus \$0.45 per 1,000 lbs. As a result of PACE, the cost of using Logan increased substantially for smaller aircraft, and declined somewhat for larger aircraft.

PACE was challenged by operators of small aircraft in US District Court and in an administrative proceeding before the US Department of Transportation (DOT). Summary Judgement upholding PACE was issued by the US District Court. However, the PACE fee structure was found to discriminate against smaller aircraft users by the DOT and, therefore, to be in violation of federal aviation statutes. The US Circuit Court of Appeals upheld the DOT. As a result, PACE was discontinued after only six months of use.

In terms of the instructiveness of PACE to a Peak Period Pricing program, it is important to understand that PACE did not relate to the peak hour at all. Rather, the increased fee applied across the entire day. While many are under the misconception that PACE was effective because of a subsequent decline in Logan regional carrier and general aviation operations, this decline was experienced at other airports in the region and was more related to market factors than PACE. The restructuring of the regional carrier industry at Boston and in New England continued well after PACE was rescinded.

1993 Boston Logan Peak Period Pricing Concept

During 1992-1993, high and increasing levels of delay caused Massport to revise the PACE proposal to reflect the DOT decision. In the modified approach, peak hour fees applied only to the most congested period of the day, and the method of airfield cost allocation was carefully calculated using the utility industry as a model. The resulting peak hour fee proposal had three components: (1) an operations charge for all aircraft

irrespective of weight, (2) a weight based charge, and (3) a peak hour fee between 2:00 PM and 8:00 PM (for both landings and takeoffs). The proposal was designed to be revenue neutral, but the effect on individual users differed. Smaller aircraft would pay more than under the traditional method, and larger aircraft would pay less. The peak hour pricing proposal was taken through the analytical phase and an informal public process with a wide range of interest groups, as well as briefings for the FAA and the DOT Office of the Secretary. In 1993, Massport determined that it was appropriate to reexamine the Logan delay problem from a more detailed perspective, particularly in light of fleet mix changes. The Logan Airside Improvements Feasibility Study was initiated which examined the nature of the delay problem and a broader range of potential delay reduction mechanisms. Peak Hour Pricing was one of the options studied.

Sydney Australia Peak Hour Pricing

In 1989, the Federal Airports Corporation in Australia implemented one of the few true demand management policies at Sydney Airport. The components of this pricing mechanism meet the economic and practical standards for peak hour pricing theory: access to the airport was not controlled by slots or any other regulatory mechanism; the charge was related to the airport's peak congestion period; and the charges applied to both arrivals and departures. The program was initially applied only to general aviation, but extended to all flights in 1991. A flat A\$250 fee was charged for each landing or takeoff during peak periods in both morning and evening; during shoulder periods on either side of the peaks, the fee was A\$200 per landing and A\$100 per takeoff. The Sydney pricing resulted in a 28 percent reduction in peak period flights (all by non-jets), while actually increasing the passenger seat capacity.

Seattle Congestion Management Study

As part of the decision process on a new runway for Sea-Tac airport in 1995, a study of various Peak Period Pricing structures concluded that fees as high as \$200 would remove at most seven percent of the peak hour operations.

3.5.1.3 Federal Slot Reforms

In the interests of promoting airline competition and service to underserved communities, the federal government enacted slot reforms through passage of the Federal Aviation Investment Act for the Twenty-First Century ("AIR-21") in April 2000. AIR-21 provides for the phased elimination of slots at the New York airports and Chicago O'Hare. Slot-restrictions at LaGuardia and J.F. Kennedy International will be lifted after January 1, 2007 and slot-restrictions at Chicago O'Hare will be terminated after July 1, 2002. At Washington Reagan National Airport, AIR-21 created 24 new slots.

AIR-21 also created interim slot exemptions for the LaGuardia, J.F. Kennedy International, and Chicago O'Hare Airports. The interim slot rules effectively lifted slot restrictions for carriers wanting to serve small or non-hub communities with small aircraft (under 71 seats) and for new entrant or limited incumbent carriers (carriers with 20 or fewer slots). Although the interim exemptions applied to three of the High Density

airports, the overwhelming majority of airline exemption requests were for LaGuardia. Carriers filed exemption requests for more than 600 additional daily flights at LaGuardia, which would have increased daily scheduled operations by more than 50 percent. Carriers proposed to operate two-thirds of the additional flights with regional jet aircraft and one-third with turboprop aircraft.

By November 2000, airlines were operating more than 200 of the proposed AIR-21 services at LaGuardia, representing a 26 percent increase in scheduled operations over the prior year. The substantial increases in aircraft activity resulted in unprecedented levels of delay at LaGuardia. In September 2000, the FAA OPSNET database showed that LaGuardia experienced more than 9,000 flight delays compared to 3,100 delayed flights a year earlier. The FAA estimates that 25 percent of flight delays in the United States in September 2000 occurred at LaGuardia, compared to approximately 12 percent before AIR-21.

In response to the substantial increases in activity and delays, the Port Authority of New York and New Jersey ("PANYNJ"), which operates LaGuardia, sought voluntary measures from the airlines to minimize airport congestion. In August 2000, the PANYNJ requested that air carriers schedule AIR-21 eligible service outside of the airport's most congested operating hours. The airlines did not respond to the PANYNJ's request. Subsequently, the PANYNJ announced a moratorium on new services until a demand management measure could be adopted.

The FAA did not sanction the moratorium and began immediate discussions with the PANYNJ to devise a short-term demand management strategy for the airport. The FAA and the PANYNJ agreed to allocate a limited number of AIR-21 slot exemptions to airlines through a slot-lottery. The allocation of AIR-21 services is an interim measure intended to mitigate the air service disruptions and delays brought on by the AIR-21 slot exemptions. The lottery was conducted in January 2001, and it increased the total number of hourly operations at LaGuardia, which has just two runways, from 68 to 81. As a result, the number of AIR-21 slot exemptions was limited to 150 daily operations. In its decision to allocate flights authorized by AIR-21, the FAA made clear that the lottery was a Federal action and that the PANYNJ could not have acted on its own to limit airport operations.

The FAA is currently in the process of developing a long-term demand management policy that will become effective at LaGuardia in September 2001. Through this process the FAA intends to articulate demand management measures that would be available to all airport operators. It is expected that any demand management policy promulgated by the FAA will be shaped by two recent forces in the aviation industry, the AIR-21 slot reforms and the widespread introduction of regional jet aircraft. The pending FAA decision is expected to result in updated federal guidance for other airports, such as Logan, on the appropriate structure for demand management programs, including Peak Period Pricing.

3.6 Alternative Packages

For analytic purposes, the various airside improvement concepts identified previously were grouped into different packages of alternatives. The alternatives have been structured to provide a clear basis for assessing the operational benefits and environmental impacts of the proposed improvements as compared to each other and the No Action Alternative.

The following sections describe the range of alternatives considered in the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR.

3.6.1 Alternative 1 – All Actions

Alternative 1 would involve implementation of all recommended concepts (see Figure 3.1-1). This would include construction of unidirectional Runway 14/32, construction of the Centerfield Taxiway, realignment of Taxiway November, extension of Taxiway Delta, and reconfiguration of the Southwest Corner taxiway layout. In addition, reduced minimums for Runways 22L, 27 and 15R would be implemented and a Category III ILS would be operational for Runway 33L. A Peak Period Pricing surcharge would also be implemented.

In addition to the full analysis of this alternative, several individual case studies for Runway 14/32 were conducted to examine the runway's effectiveness under specific operating and weather conditions. Descriptions and results of these specialized case studies are presented in Appendix H and I of the Airside Project Draft EIS/EIR.

3.6.2 Alternative 1A - All Actions Except Peak Period Pricing

Alternative 1A is a subset of Alternative 1, and includes all improvements except Peak Period Pricing (see Figure 3.1-1). Massport added this alternative to the analysis in response to public comment on the alternatives presented in the Airside Project ENF. Since the initial on-airfield alternatives included Peak Period Pricing in all but the No Action scenario, there was no opportunity to gauge the specific impact of a Peak Period Pricing scenario independent of the runway.

In response to these comments, Alternative 1A was developed by eliminating Peak Period Pricing from Alternative 1. In this manner, by comparing the operational, environmental, and socioeconomic impacts of Alternative 1 with those of Alternative 1A, an understanding of the incremental benefits of Peak Period Pricing is possible.

During the public scoping period and through the Airside Review Committee and SDEIS Panel processes, certain commenters suggested that there was considerable potential for significant adverse economic impacts associated with Peak Period Pricing. To more clearly evaluate and identify the individual effects of a Peak Period Pricing program, specialized case studies which focus on regional carriers and affected markets were also

conducted. Details and findings of these case studies are presented in Appendices E and F of the Airside Project Draft EIS/EIR.

3.6.3 Alternative 2 - All Actions Except Runway 14/32

A second "Build" Alternative was developed to facilitate a clear understanding of how the airfield might operate if all the improvement concepts were implemented except a unidirectional Runway 14/32 (see Figure 3.1-2). Accordingly, Alternative 2 combines all recommended actions other than the runway. All proposed taxiway improvements are included. Comparison of Alternatives 1 and 2 provides insight into the incremental benefit of the proposed unidirectional Runway 14/32 in reducing congestion and delay and the associated environmental impacts.

3.6.4 Alternative 3 - No Build

Alternative 3 is considered to be the No Build alternative in that it consists only of the operational and administrative improvement concepts: i.e., reduced minimums for Runways 22L, 27, 15R, and 33L (includes CAT III ILS), and Peak Period Pricing. Implementation of this alternative would not involve construction of any physical improvements. Comparison of Alternative 3 with Alternative 2 provides insight into the operational and environmental impacts of the taxiway modifications.

3.6.5 Alternative 4 - No Action

The No Action Alternative (Alternative 4) evaluates the impacts of not implementing any Airside Project improvements. It is assumed, however, that routine maintenance and minor annual improvements would be ongoing. Alternative 4 serves as the baseline for evaluating the effectiveness of all alternatives, and provides additional context for assessing the Preferred Alternative.



4

Delay Analysis

Key Points

Logan suffers from a serious aircraft delay problem and is consistently ranked among the most delayed airports in the country. In 2000, Logan was the 6th most delayed airport in the United States in terms of total delays. Logan fared even worse in arrival delays, ranking as the 2nd worst airport in the nation. This is Logan's lowest ranking in the last decade. If no improvements are made, delays will become significantly worse, especially those that the Airside Improvements Planning Project (Airside Project) improvements can alleviate, i.e., those occurring under Visual Flight Rule (VFR) conditions when wind levels (particularly from the northwest) reduce existing runway capacity. If no action is taken to address this situation, total annual delays (runway and taxiway) will increase from an estimated 142,000 hours to as much as 363,000 hours under the 37.5 million passenger High Fleet scenario. The average delay would increase from 17 to 36 minutes per flight.

This chapter reviews the activity forecasts, the delay modeling methodology and the results of the airfield delay analysis with the Preferred Alternative (Alt 1A). While the Airside Project Draft Environmental Impact Statement/Environmental Impact Report (Draft EIS/EIR) provided a discussion of all Alternatives and all fleets, this Supplemental Draft EIS/Final EIR focuses the discussion on the results of the Preferred Alternative compared to the No Action Alternative for the 29 million passenger Low Fleet (29M Low Fleet) and the 37.5 million passenger High Fleet (37.5M High Fleet). These fleets reflect the range of likely future passenger and activity levels. The remaining fleets and Alternatives are described in Appendix C.

In response to the FAA directive resulting from the SDEIS Panel process, this chapter presents a third fleet. This fleet assumes that the 37.5 million passengers will use more regional jets (RJs) and fewer non-jet aircraft than previously forecast, and is called the 37.5M High RJ Fleet. This scenario examines the delay reduction utility of all of the proposed improvements including unidirectional Runway 14/32 and Peak Period Pricing.

The principal findings of this section are as follows:

- Based on the modeling of current conditions, Logan incurs an estimated 120,000 annual hours of runway delay. With the availability of unidirectional Runway 14/32 and the other recommended improvements comprising the Airside Project Preferred Alternative, delays could have been reduced by 32 percent, with a 69 percent reduction in Visual Flight Rules (VFR) delays. Delays during northwest wind conditions would have been reduced by nearly 90 percent.

- The lack of a third available runway in the east-west operating direction causes an unbalanced geographic distribution of jet operations at Logan Airport. Approximately three-quarters of Logan's current jet flights overfly communities impacted by the north/south runway configurations. Under the 37.5M High Fleet scenario, Logan's reliance on north/south runways will increase to over 90 percent. The proposed Runway 14/32 will allow for a more balanced distribution of operations, reducing reliance on the north/south runway configurations to 41 percent.
- The proposed Runway 14/32 will also permit a substantial increase in use of the preferred arrival and departure routes over the water. Under the 29M Low Fleet scenario, approximately 52,000 jet operations, or 17 percent of total jet operations, would shift from flight paths over communities to flight paths over the water. Under the 37.5M High scenario, 89,000 jet operations would shift to flight paths over the water.
- Taxiway improvements will reduce ground delays by 47 percent with the 29M Low Fleet and 26 percent with the 37.5M High Fleet (Alternative 2 vs. Alternative 3) by eliminating constraints and inefficiencies in the taxiway system. The proposed runway also makes a positive contribution to reducing Logan's taxiway delays. With the Preferred Alternative, including the runway, taxiway delays are reduced by 65 to 70 percent (Preferred Alternative vs. No Action).
- A reduction in approach minimums for Runways 15R, 22L, 27 and 33L provides modest delay reduction but significantly enhances safety by increasing runway availability in Instrument Flight Rules (IFR) weather conditions. Reducing minimums does not change the flight path of arriving flights, but moves the decision point for missed approaches towards the airport and, in most cases, within the airport boundary. This will allow the principal noise impacts from go-around operations to occur over the airport, rather than closer to residential areas.
- Peak Period Pricing is designed to reduce delays that occur when airlines schedule flights beyond the airfield's capacity. Overscheduling has not been a significant factor in delays at Logan since 1993, but could reoccur in the future. However, Massport intends to put in place a process that will allow for a timely response to airline overscheduling. Massport has designed an airline schedule monitoring system, and is committed to implementing Peak Period Pricing if airline overscheduling should emerge in the future as a source of delays.
- Peak Period Pricing produces only limited delay reduction benefits under near- and long-term Low Fleet scenarios. For example, under the 29M Low Fleet scenario, Peak Period Pricing would incrementally reduce runway delays by 2 percent or less, while imposing over \$6 million in additional costs on Logan's regional carriers and potentially impacting access to Logan from small communities. However, under the long-term High Fleet scenario which is characterized by airline overscheduling, Peak Period Pricing provides meaningful delay reduction benefits.

- Incorporating an exemption program for small communities would reduce the expected degree of service disruption resulting from Peak Period Pricing. With a limited number of exemptions, the delay reduction benefits of Peak Period Pricing could generally be maintained under the High Fleet scenario where airline overscheduling is a significant cause of Logan delays.
- An additional future fleet scenario was developed and evaluated for this Supplemental DEIS/FEIR, the 37.5M High RJ Fleet. This fleet is characterized by a substantial volume of regional jet aircraft and a reduced level of non-jet operations.
- Independent FAA analysis examined the probable utilization of the 5,000-foot runway by regional jets and determined that the runway length would be acceptable for most of the regional jet types projected to operate at Logan.
- Based on the runway utilization assumptions provided by the FAA consultant, approximately 70 percent of the regional jet aircraft in the 37.5M High RJ fleet will be able to land on Runway 32. Operational analysis of the 37.5M High RJ Fleet found that the Preferred Alternative would reduce annual delays by 109,000 hours, or 29 percent when compared to the No Action Alternative.
- Placing a northwest wind restriction on Runway 14/32 would limit the increase in jet departures on Runway 27 that results from the availability of a third three-runway configuration at Logan. However, this restriction would sacrifice a portion of the delay reduction benefits provided by Runway 14/32, and would also limit the level of the relief provided to communities impacted by the north/south runway configurations which are already the most heavily utilized at Logan.
- The illustrative Peak Period Pricing program with a \$150 surcharge was ineffective at reducing delays under the 37.5M High RJ Fleet scenario. A higher peak fee would be required to provide meaningful delay reduction under this scenario, principally due to the higher revenue and profitability of regional jet services as compared with non-jets. An effective Peak Period Pricing program that would eliminate overscheduling in the 37.5M High RJ Fleet was projected to reduce runway delays by approximately 68,000 annual hours or 18 percent (Alternative 2/3).
- Since the original 1983 version of the Preferential Runway Advisory System (PRAS), two major enhancements have been installed in the FAA control tower. The PRAS enhancements have led to significant improvements in PRAS conformance, despite increasing levels of flight activity at Logan.
- Massport has designed protocols to assess achievement of PRAS goals and is committing to: (1) publish results on a more regular basis, (2) broaden its distribution list, and (3) expand the set of reported data to provide a more complete representation of PRAS conformance.

4.1 Overview

Logan suffers from a serious aircraft delay problem and is consistently ranked among the most delayed airports in the country. The airfield's VFR capacity of approximately 120 operations per hour is sufficient to accommodate current levels of aircraft demand. However, delays accrue when weather conditions, particularly strong northwest winds, lower airfield capacity to levels well below normal operating conditions. If effective measures for dealing with delays are not implemented, the disproportionate level of delays at Logan will continue to worsen.

While Massport and the FAA cannot entirely eliminate delays at Logan, the proposed runway will improve Logan's reliability and reduce delays by preventing the decline in airfield capacity that now occurs in northwest winds. The proposed improvements will also enhance the safety and efficiency of Logan's runway and taxiway systems and provide increased operating flexibility, particularly during periods of low visibility.

This chapter describes the delay and operational analyses that were used to evaluate the proposed improvements and analyze the impacts of the Preferred Alternative. The evaluation considered a range of forecast passenger and aircraft activity levels at Logan to provide a full understanding of the potential benefits and impacts of the recommended improvements.

In the Airside Project Draft EIS/EIR, historic Logan activity from 1993 was used to provide historical context to the assessment of aircraft delays and environmental impacts. For this Supplemental DEIS/FEIR, these 1993 conditions were supplemented and updated with an analysis of Logan operating conditions during 1998. By including this analysis, the Supplemental DEIS/FEIR provides an assessment of more recent delays at Logan and quantifies the delay reduction benefits that would occur with the recommended Preferred Alternative. The 1993 and 1998 analysis conditions are described in Section 4.2.

Since the Airside Project Draft EIS/EIR forecasts were originally developed in 1995, Section 4.2 also analyzes recent changes in passenger demand, airline fleets, and airline scheduling. Based on these trends, an additional fleet forecast, the 37.5M High RJ scenario, was developed to ensure that the airside analysis considered an appropriate range of future conditions.

Some comments received on the Airside Project Draft EIS/EIR expressed a concern that the Preferred Alternative could stimulate an increase in passenger traffic and/or aircraft operations. Therefore, this section also includes a discussion of induced demand, explaining that implementation of the Preferred Alternative will not cause growth in Logan passengers or operations or impact the timing of expected growth.

While delay reduction is a principal objective of the recommended Airside Project improvements, proposed Runway 14/32 enables air traffic controllers to better achieve the goals of the Preferential Runway Advisory System (PRAS) or any other preferential runway system where a more equitable distribution of noise is the objective. Section 4.3 of this chapter provides a thorough discussion of PRAS, including its history at Logan, recent enhancements to the PRAS system, and the improvement in historic PRAS conformance facilitated by those enhancements.

In response to the Executive Office of Environmental Affairs (EOEA) Secretary Certificate on the Airside Project Draft EIS/EIR (May 7, 1999), this section also includes discussions of improved monitoring and public reporting of PRAS conformance and of the potential for extending the current nighttime overwater routing preference beyond the existing midnight to 6:00 AM period.

Each of the five alternatives was evaluated through state-of-the-art computer modeling. Comparisons between the various improvement alternatives and the No Action Alternative show the reduction in delay levels and environmental impacts that would be produced with each improvement package. The delay analysis is based on detailed simulations of aircraft operations at Logan, including the flow of aircraft in surrounding airspace, the selection and utilization of various runway configurations, and the movement of arriving and departing aircraft between gates and runways on the airport taxiway system. The analytical approach is described in Section 4.4, and it provides a direct linkage between the models that calculate delays and the models that measure environmental impacts.

Peak Period Pricing was not recommended for immediate implementation as part of the Preferred Alternative. However, Massport does recognize the delay reduction benefits associated with this demand management strategy under potential future conditions of airline over scheduling. As part of the Final EIR, the Secretary instructed Massport to conduct additional analyses to provide a more thorough evaluation of Peak Period Pricing. Section 4.5 describes these three analyses.

First, Massport defines the overscheduling conditions that would lead to implementation of Peak Period Pricing, and designs a monitoring system to determine when these conditions will materialize. Next, a tightly crafted exemption program is developed to protect "greatly affected communities" from losing connections to the national air transportation system. Finally, the section discusses the potential for alterations in the regional airline fleet mix at Logan and/or increased utilization of alternative regional airports that may result from Peak Period Pricing.

In Section 4.6, the results of the airfield delay and operational analysis are described. This section includes an evaluation of how Logan delays will grow in the future without improvements to the airfield, and demonstrates how the Preferred Alternative will limit the growth in delays. The delay analysis has been expanded to include 1998 operating conditions at Logan. This analysis quantifies the current level of Logan delays and identifies the delay reduction benefits that would have been realized if the Preferred Alternative had been available in 1998.

In Section 4.7, operational and delay results for all improvement alternatives with the 37.5M High RJ Fleet are presented. While the 37.5M High RJ Fleet analysis modeled regional jet use of Runway 32 based on the regional jet utilization estimates from an independent FAA analysis, a range of assumptions regarding regional jet use of Runway 32 was also tested. This section also discusses the effect of restricting the use of Runway 32 to northwest wind conditions only. The analysis of various wind restrictions using the 37.5M High RJ Fleet is presented, and the impacts of a restriction on delays, runway use and PRAS performance are discussed.

4.2 Historic Conditions, Recent Trends, and Forecast Passengers and Operations

This section describes the various passenger and operations scenarios that were used in the analyses of the Airside Project Draft EIS/EIR and this Supplemental DEIS/FEIR. Historic and current conditions are described, recent trends are analyzed, and the future forecast scenarios are presented. The development of the 37.5M High RJ Fleet is explained in detail, and the issue of induced demand is also addressed.

4.2.1 Historic Conditions

In the Airside Project Draft EIS/EIR, modeled delay and environmental analyses were presented based on 1993 Logan activity levels and five future operating scenarios. In many instances, 1993 was referred to as the base year because it provided historic context for the analysis presented in the Airside Project Draft EIS/EIR. The EOECA Certificate requested that Massport clarify the use of 1993 in the airside analysis and, if appropriate, provide more current information to supplement the base year analysis.

It is important to understand that the recommendations advanced by Massport in the Airside Project Draft EIS/EIR were based on the comparative delay reduction, environmental, and economic impacts of the various improvement alternatives under the various future operating scenarios. Benefits and impacts were determined through comparisons of each improvement alternative (Alternatives 1, 1A, 2, and 3) with Alternative 4 (the No Action Alternative). In this regard, Alternative 4 represented the effective "base case" under each future operating scenario.

The year 1993 was a peak year for small aircraft operations at Logan Airport, and the demand profile exhibited a relatively high degree of hourly peaking compared to the current profile. It was originally chosen since it represented the most recent data available at the beginning of the Logan Airside Improvements Feasibility Study. It also illustrated operational and environmental conditions during a period of airline overscheduling and high delays. To supplement the 1993 historic analysis, 1998 conditions have been examined in this Supplemental Draft EIS/Final EIR to provide a more recent point of reference for the operational and environmental results. While 1998 exhibited a level of overall demand similar to that in 1993, the 1998 operations exhibited less hourly peaking and included fewer non-jet aircraft. In addition to providing an updated historic context, 1998 conditions

were also analyzed to determine the delay reduction benefits that would have been realized had the Preferred Alternative been implemented in 1998.

4.2.2 Recent Trends

The forecasts presented in the Airside Project Draft EIS/EIR were developed in 1995 at the beginning of the Airside Project. Since these forecasts were developed through the analysis of historic trends and expected future conditions at a particular point in time, it is appropriate to examine recent trends to ensure that the forecasts of future activity still encompass a reasonable range of future scenarios. There were three key developments in the last six years that could impact future activity at Logan:

- Passenger growth at Logan has slowed due to service expansion at New England's regional airports.
- Regional jet aircraft have entered the fleet and services have expanded rapidly.
- Logan's demand profile has become less peaked as airline schedules have smoothed and spread out more evenly over the day.

4.2.2.1 Slower Passenger Growth

Logan passenger growth has slowed significantly, averaging 2.4 percent per year since 1995 and growing only 1.3 percent from 1999 to 2000. This can be compared to the average annual growth rate of 3.1 percent between 1980 and 2000. As explained in Chapter 2 of this Supplemental DEIS/FEIR, this slower growth is primarily due to air service expansion at New England's regional airports. In October 1996, Southwest Airlines entered the New England market, opting to serve Providence (and later Manchester) instead of Logan Airport. This air service expansion and the introduction of competitive fares have resulted in significant growth at both Manchester and Providence. In addition, increased efforts to market the regional airports and the introduction of air travel alternatives, such as Amtrak's Acela service to New York, have also helped develop regional transportation options for New England travelers. This regionalization has effectively dampened Logan's passenger growth rate to a level below that expected when the forecasts for the Airside Project Draft EIS/EIR were originally developed.

4.2.2.2 Rapid Growth in Regional Jets

Regional jets were just entering service when the Airside Project Draft EIS/EIR forecasts were finalized, and while the fleet forecasts accounted for growth in regional jets, they did not anticipate how quickly or extensively airlines would incorporate regional jets into their fleets. In October 1995, there were only 340 regional jets in service worldwide, but by October 2000, carriers had over 1,100 regional jets in service and almost 2,600 on order or option. These regional jets are now serving Logan, and have represented the fastest growing segment of Logan flight demand in recent years.

Logan's regional airlines have traditionally operated non-jet aircraft and have served markets within 400 miles of Boston. The regional jet has expanded the radius of

destinations accessible with small aircraft to approximately 1,000 miles and permitted new nonstop service in medium volume markets such as Richmond, Norfolk, Greensboro, Nashville, Indianapolis, and others. These regional jets have also allowed carriers such as American and Delta to develop competitive jet service patterns in high-volume markets dominated by other carriers. A prime example is the Boston-Philadelphia market, where both American and Delta have initiated high-frequency regional jet services in competition with US Airways (which provides 17 daily round trips with full-size jets).

4.2.2.3 Smoother Demand Profile

The third development that may impact future activity is the smoothing of Logan's demand profile. Figure 4.2-1 shows how the shape of Logan's demand has changed over the last five years. While there have been a number of changes in the characteristics of Logan's demand, the flatter profile can be attributed to three main factors:

- Increased off-peak activity with less activity during the peak;
- Increased frequencies in jet markets; and
- The decline in Logan non-jet activity.

Over the past several years, airlines have increased their off-peak activity at Logan, with a significantly higher percentage of arrivals and departures occurring in the early morning and late evening (see Table 4.2-1). The total growth between 1995 and 2000 was 56 scheduled weekday operations; however, all of that growth occurred in the early morning and late night hours. Early morning operations grew by over 25 percent, with much of the growth in short-haul East Coast markets such as Philadelphia and New York. Over 80 percent of that growth occurred between the hours of 6:00 AM and 8:00 AM. Late-night operations grew by a similar amount, with increases in a wide range of medium- and long-haul markets. Operations during the daytime periods, and even during the peak afternoon period, declined even as the total operations increased, and this pattern was observed in all scheduled market sectors: North American Jet, International Jet, and Non-Jet.

Figure 4.2-1
Comparison of August Weekday Peaking Patterns – 1995 vs. 2000

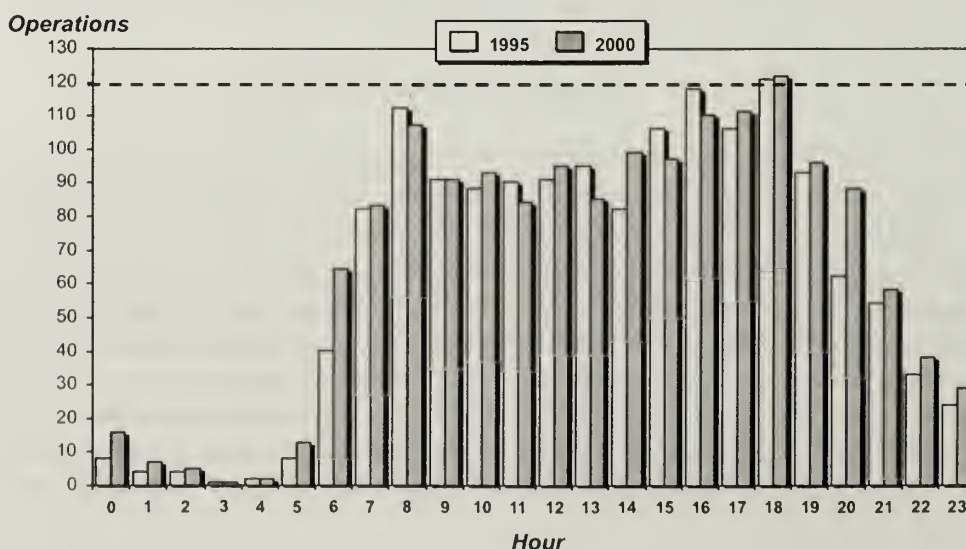


Table 4.2-1
Scheduled August Weekday Passenger Operations by Period: 1995 vs. 2000

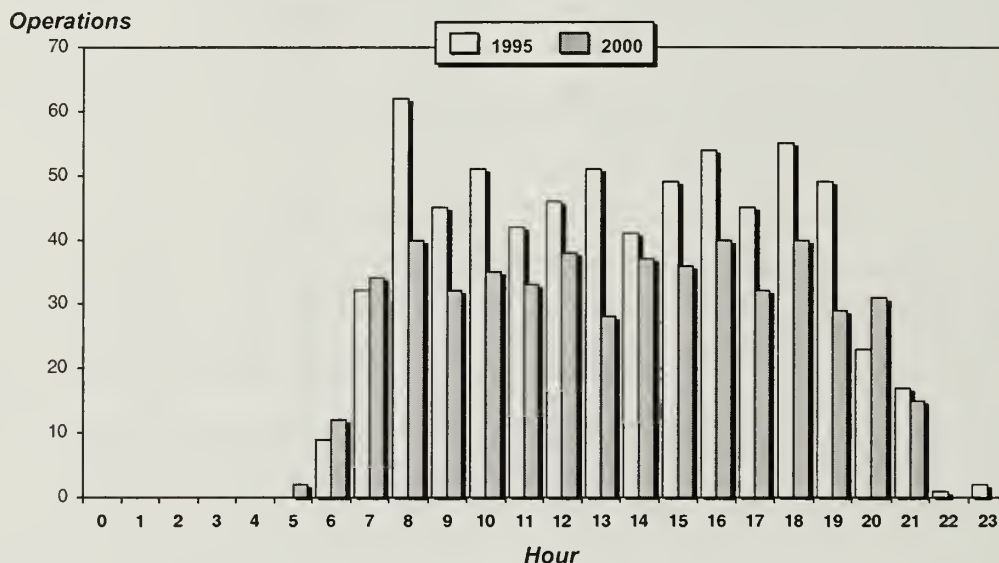
Period	Operations			Percentage	
	1995	2000	Change	1995	2000
Midnight – 4:00 AM	3	15	12	0.2%	1.1%
4:00 AM – 8:00 AM	106	134	28	7.8%	9.4%
8:00 AM – 12:00 PM	356	345	(11)	26.1%	24.3%
12:00 PM – 4:00 PM	352	349	(3)	25.8%	24.5%
4:00 PM – 8:00 PM	404	396	(8)	29.6%	27.8%
8:00 PM – Midnight	<u>145</u>	<u>183</u>	<u>38</u>	<u>10.6%</u>	<u>12.9%</u>
Total	1,366	1,422	56	100.0%	100.0%

Source: OAG Schedule Tapes

Along with the increased off-peak activity, increased jet frequencies also tend to flatten the demand profile by providing a steady level of operations all day long. In August 1995, Logan had non-stop service to 61 jet destinations with an average frequency of 5.7 round trips per weekday. In August 2000, Logan had nonstop service to 64 jet destinations with an average frequency of 7.1 round trips per weekday. Furthermore, the average frequency to Logan's top ten jet destinations increased from 17.8 daily round trips to 21.4 daily round trips. As frequencies to an individual destination increase, operations tend to become less concentrated during the peak periods.

The changes in Logan's non-jet fleet have also played a role in flattening the demand profile. Figure 4.2-2 compares the scheduled non-jet activity at Logan in 1995 and 2000. Non-jets have historically been the most peaked market segment at Logan, but over the last several years, non-jet activity at the airport has declined in both total and peak hour activity. Logan served 40 non-jet destinations in August 1995 but only 27 non-jet destinations by August 2000. Non-jet carriers pulled out of markets such as Hartford, Lebanon, and Manchester, even though each had at least six daily round trips in August 1995. In addition to the market reduction, the number and distribution of non-jet operations has changed. In August 1995, Logan averaged 49 hourly non-jet operations between 8:00 AM and 8:00 PM with a peak hour level of 62 operations. By August 2000, Logan averaged only 35 hourly non-jet operations over the same twelve-hour period, reaching a peak level of only 40 hourly operations.

Figure 4.2-2
August Weekday Scheduled Non-Jet Demand: 1995 vs. 2000



4.2.2.4 Summary of Recent Trends

It is reasonable to expect that the recent trends observed at Logan will continue into the future: 1) slower passenger growth, 2) increased regional jet activity, and 3) a smoother demand profile. Ongoing efforts towards regionalization will cause passenger growth to continue at a slower rate, consistent with the growth predicted in the FAA Terminal Area Forecasts. Regional jets have operational and economic advantages for serving medium density markets within 1,000 miles and for allowing competitive entry into high-volume markets. These aircraft are therefore likely to play a significant role for Logan carriers well into the future. Finally, the less-peaked demand is expected to continue. In general, peaks tend to spread as demand grows and frequencies increase. Also, the move from turboprop aircraft to regional jets ensures a continued decline in the Logan market segment with the most peaked demand.

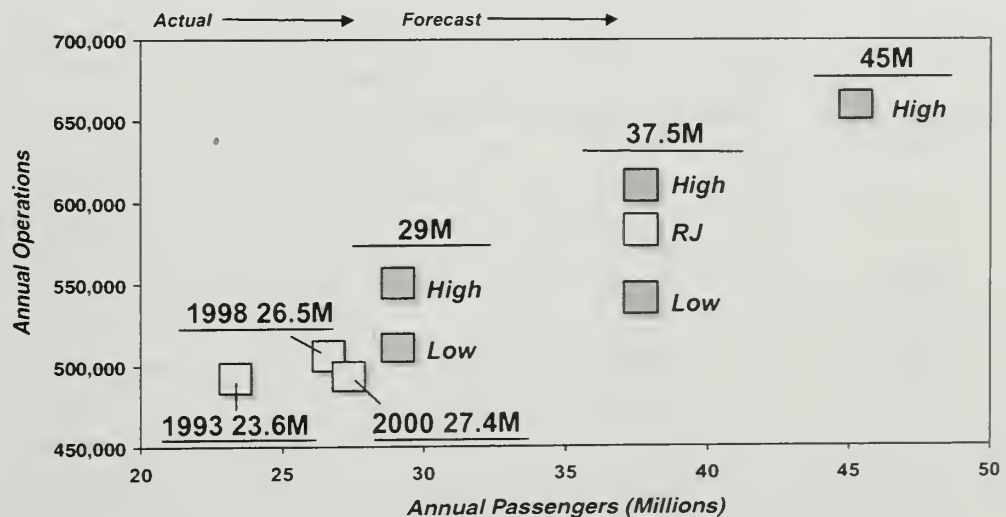
The forecasts presented in the Airside Project Draft EIS/EIR covered a wide range of passenger levels and fleet mixes, and they continue to represent an appropriate range of future activity for the purposes of this analysis. However, in light of the more recent trends and the likelihood that they will continue, an additional future scenario was developed for this Supplemental DEIS/FEIR to ensure that all reasonable forecast conditions were addressed.

4.2.3 Passenger Forecasts

In order to evaluate the Airside Project Alternatives under a variety of future scenarios, Massport has developed a range of near- and long-term passenger forecasts. As shown in Figure 4.2-3, three different passenger volumes (29 million, 37.5 million, and 45 million) were evaluated for a range of operations levels. Based on the slower passenger growth due to regionalization discussed in the previous section, the airport is expected to reach 29 million passengers within a few years, 37.5 million passengers around 2015, and 45 million passengers sometime after 2020. These projections reflect more conservative growth than the forecasts presented in the Draft EIS/EIR, which assumed that Logan would reach 29 million passengers in 1999 and 37.5 million by 2010.

While the time frames associated with the forecasts in the Airside Project Draft EIS/EIR have been adjusted to reflect the growth at regional airports, the aircraft fleet forecasts, the delay modeling, and the environmental analyses associated with the passenger levels are still appropriate near- and long-term term scenarios. By adjusting the time frame associated with each of the passenger levels rather than adjusting the passenger levels themselves, the 29 million, 37.5 million, and 45 million passenger scenarios in this Supplemental DEIS/FEIR can still be compared with similar scenarios examined in other Logan analyses.¹ Furthermore, these revised forecast dates are consistent with the FAA's most recent Terminal Area Forecasts which project that Logan will handle 33.6 million passengers in 2010 and 37.1 million in 2015. By examining historic 1993 conditions, recent demand (1998), and near- and long-term planning values of 29, 37.5, and 45 million passengers, the airside analysis has incorporated a comprehensive set of past, present, and future demand levels that provide a broad context for the evaluation of the proposed Airside Project improvement alternatives.

Figure 4.2-3
Logan Airside Passenger and Fleet Forecasts



¹ Previous Logan Airport Generic Environmental Impact Reports (GEIRs) and Annual Updates, as well as the 1999 Environmental Status and Planning Report (ESPR), published in December 2000, have all examined future passengers levels of 29M, 37.5M, and/or 45M.

4.2.4 Operations Forecasts

While the various passenger forecast scenarios represent near- and long-term passenger demand for airport services, the aircraft operations forecasts tie that demand to the airside modeling process. The forecast variables that impact the operations and environmental analysis include:

- The demand level in terms of aircraft operations;
- The mix of aircraft types; and
- The demand profile, or the distribution of operations by hour across the operating day.

The Airside Project Draft EIS/EIR included six forecasts of future activity (five of which were carried through the detailed analysis process)², with a Low Fleet and High Fleet operations scenario for each of the three forecast passenger levels (29M, 37.5M, and 45M). These Low Fleet and High Fleet scenarios represent two different ways that a single future passenger volume could be satisfied. The Low Fleet forecasts reflect the assumption that commuter aircraft will make up a smaller share of the fleet serving Logan, while the High Fleet forecasts reflect the greater use of small aircraft and the resulting need for more flights to carry a given number of passengers.

To incorporate the recent Logan trends discussed previously in this section, an additional analysis scenario, referred to as the 37.5M High RJ Fleet, has also been developed. The 37.5M High RJ Fleet assumes slow passenger growth due to regionalization, reaching 37.5 million passengers circa 2015. To reflect the smoother demand profile, the hourly distribution of demand is based on the current demand profile rather than the more peaked profile from FY1995 that was used to develop the profiles for the Airside Project Draft EIS/EIR forecasts. The 37.5M High RJ Fleet also assumes significant growth in regional jet activity.

By developing a forecast that represents relatively high regional jet growth, the operational and environmental impacts of regional jets are bounded by the lower level of regional jets in the Airside Project Draft EIS/EIR forecasts and by the higher level in the 37.5M High RJ Fleet. Table 4.2-2 presents the full range of operations forecasts analyzed in the Airside Project. These alternatives are designed to ensure that the airfield analysis includes an appropriate range of future conditions at Logan. The delay results for the 29M High, 37.5M Low and 45M High Fleets are summarized Appendix C, while the operational results for the 29M Low, the 37.5M High, and the 37.5M High RJ Fleets are presented in the following sections.

▼
2 The 45M Low Fleet forecast was initially evaluated with the runway capacity and delay models but was not carried through the detailed taxiway and environmental analysis process because of its similarity to the 37.5M High Fleet scenario.

Table 4.2-2
Logan Near- and Long-Term Operations Forecasts

Forecast Scenario (Passenger Level and Fleet)	Aircraft Operations
29M Low	510,000
29M High	552,000
37.5M Low	543,000
37.5M High RJ	585,000
37.5M High	608,000
45M Low	580,000
45M High	656,000

Notes: The 37.5M High RJ Forecast was not analyzed in the Airside Project Draft EIS/EIR and has been added as an additional scenario in this Supplemental Draft EIS/Final EIR.

The 45M Low operations forecast was initially evaluated with the runway capacity and delay models, but was not carried through the detailed taxiway and environmental analysis process because of its similarity to the 37.5M High Fleet scenario.

4.2.4.1 Near-Term Planning Forecasts

The development of the near-term 29M Low and High Fleets is explained in detail in Chapter 4 and Appendix E of the Airside Project Draft EIS/EIR. Table 4.2-3 compares the major features of the 29M High and Low Fleet operations scenarios, but this Supplemental DEIS/FEIR focuses on the 29M Low Fleet for the operational and environmental analyses. Both alternatives are based on 29 million annual passengers, but non-jet aircraft carry 11 percent of the passengers in the High Fleet scenario compared to 9.5 percent in the Low. This difference, combined with a higher average load factor in the Low Fleet scenario, increases the average number of passengers per operation in the Low Fleet scenario and allows Logan carriers to handle the same number of passengers with 42,000 fewer flights.

Table 4.2-3
Near-Term Operations Forecasts

	29M Low	29M High
Operations		
Mainline Jet	259,000	264,000
Regional Jet	15,000	3,000
Regional Non-Jet	<u>197,000</u>	<u>246,000</u>
Subtotal - Passenger Operations	472,000	513,000
Cargo	13,000	13,000
General Aviation	<u>25,000</u>	<u>25,000</u>
Total	510,000	552,000
Distribution of Passengers		
Jet (Mainline and Regional Jets)	90.5%	89.0%
Regional Non-Jet	9.5%	11.0%
Average Passengers per Flight		
Jet (Mainline and Regional Jets)	96.4	95.6
Regional Non-Jet	13.6	12.5

4.2.4.2 Long-Term Planning Forecasts

The discussion in this Supplemental DEIS/FEIR focuses on the 37.5M High Fleet and the 37.5M High RJ Fleet, but all of the long-term forecasts are presented in Table 4.2-4 for comparison purposes (the 37.5M Low, 37.5M High, and 45M High Fleets were described in Chapter 4 and Appendix E of the Airside Project Draft EIS/EIR). The 37.5M High RJ scenario was developed using the same basic methodology used for the other fleets, but it incorporates the recent Logan trends towards slower passenger growth, increased regional jet activity, and less-peaked demand. The major forecast assumptions for the 37.5M High RJ fleet are summarized below:

- Airport passenger traffic was assumed to grow at 2.1 percent per year, reaching 37.5 million passengers by 2015, consistent with the FAA Terminal Area Forecasts.
- Operations were forecast to grow at 1.3 percent per year, resulting in an operations level between the 37.5M Low and High Fleet scenarios.
 - Regional jet aircraft were projected to replace most turboprops and a portion of conventional narrowbody jets with less than 120 seats. High growth in regional jet operations was assumed so that the fleet tests an appropriate upper range of regional jet activity.
 - The general aviation and cargo forecasts were updated to reflect recent Logan trends. General aviation operations were forecast to reach an annual level of 41,000 operations since Logan handled approximately 40,000 general aviation operations in fiscal year 2000. Cargo operations were forecast to grow at two percent per year based on historic growth trends at the airport.

Table 4.2-4 compares the four alternative long-term forecasts. The 37.5M High Fleet requires 608,000 annual operations to handle 37.5 million passengers, while the 37.5M Low Fleet requires only 543,000 annual operations due to the higher average number of passengers per flight. The 37.5M High RJ scenario represents a mid-range 37.5 million passenger scenario in terms of both total operations and passenger operations, but the mix of passenger operations varies dramatically when compared to the 37.5M Low and High Fleets.

The Low and High scenarios have roughly three times as many non-jet operations as the High RJ Fleet, while the High RJ scenario offsets this difference with a much greater level of regional jet operations. While this seems like a large difference, the total number of annual regional carrier operations in the 37.5M High RJ scenario, including both regional non-jets and regional jets, is 249,000. This falls between the 37.5M Low value of 223,000 and the 254,000 regional carrier operations in the 37.5M High scenario. Because of the large number of regional jets in the High RJ scenario, a much higher percentage of passengers travel on jet aircraft; however, the number of passengers per jet operation is significantly lower.

Table 4.2-4
Long-term Operations Forecasts

	<u>37.5M Low</u>	<u>37.5M High RJ</u>	<u>37.5M High</u>	<u>45M High</u>
Operations				
Mainline Jet	281,000	279,000	310,000	335,000
Regional Jet	24,000	184,000	19,000	25,000
Regional Non-Jet	<u>199,000</u>	<u>65,000</u>	<u>235,000</u>	<u>253,000</u>
Subtotal - Passenger Operations	505,000	528,000	564,000	612,000
Cargo	13,000	15,000	19,000	19,000
General Aviation	<u>25,000</u>	<u>41,000</u>	<u>25,000</u>	<u>25,000</u>
Total	543,000	585,000	608,000	656,000
Distribution of Passengers				
Jet (Mainline and Regional Jets)	91.5%	97.5%	90.9%	91.0%
Regional Non-Jet	8.5%	2.5%	9.1%	9.0%
Average Passengers per Flight				
Jet (Mainline and Regional Jets)	111.9	78.7	103.2	113.6
Regional Non-Jet	16.0	14.2	14.5	16.0

While Logan has been following a Low Fleet development path since 1993/94, the recent growth in regional jets and carrier plans to develop individual regional carrier networks may suggest a shift towards a High Fleet scenario. To capture the full range of probable near- and long-term operating conditions at Logan, the operational analysis described in this Supplemental DEIS/FEIR focuses on the No Action and Preferred Alternative analysis of the 29M Low and 37.5M High scenarios. This Supplemental Draft also includes the complete analysis of the 37.5M High RJ Fleet for all improvement alternatives. Chapter 4 of the Airside Project Draft EIS/EIR compared the operating benefits of all improvement alternatives against the full range of future fleet scenarios, and these comparisons are also summarized in Appendix C of this Supplemental DEIS/FEIR.

4.2.5 Induced Demand

Some of the public comments received on the Airside Project Draft EIS/EIR suggest that implementation of unidirectional Runway 14-32 and the other proposed airside improvements will stimulate an increase in passenger traffic and/or aircraft operations at Logan Airport. However, for a series of reasons, the Preferred Alternative will not induce additional aircraft operations or passenger demand at Logan.

Implementation of the Preferred Alternative, and specifically the construction of unidirectional Runway 14/32, does not increase Logan's normal airfield capacity of approximately 120 operations per hour. This capacity is available at Logan approximately 80 percent of the time. Runway 14/32 will allow Logan to maintain this capacity during

periods of strong northwest winds that now require controllers to operate on two, and sometimes only one runway, compared to Logan's typical three-runway configurations. Runway 14/32 will increase Logan's reliability, but will not increase the airport's normal operating capacity.

The situation at Logan contrasts with runway projects at other airports where a new runway can increase airfield capacity, sometimes by a significant margin. In many cases, new runways are constructed with the specific objective of increasing capacity to accommodate higher levels of demand. For example, when Dallas-Ft. Worth International Airport commissioned a new runway (35R/17L) in 1996, its hourly arrival capacities increased from 102 to 146 under VFR conditions, and from 66 to 108 under IFR.

In addition, Logan is not a connecting hub airport and has no single dominant carrier. A connecting hub operation depends on efficient connections between arriving and departing flights. The hub carrier has a vested interest in maintaining schedule reliability, and has the ability to directly influence delays through its own scheduling decisions, due to the high percentage of total airport activity that its own flights represent. This is not the case at a highly competitive airport such as Logan.

Logan is principally an O&D airport, not a connecting hub facility, and no single airline at Logan maintains a dominant share of total airport flight activity. As a result, the scheduling decisions of any individual carrier will have only limited impact on overall airport delays, and it is therefore unlikely that carriers are currently suppressing flight schedules due to delays at Logan. Comparatively low passenger load factors at Logan provide further evidence that flight schedules are not being artificially depressed by delay conditions.

Unlike the Dallas-Ft. Worth runway project and others, the proposed unidirectional Runway 14/32 will not increase Logan's normal operating capacity. It will, however, substantially reduce the delays that now occur during northwest wind conditions. Preventing these delays will represent a benefit to the passengers and airlines that currently experience them. However, these wind conditions and the associated aircraft delays are not regular or predictable, and cannot be readily anticipated by airlines or passengers. Therefore, preventing these delays will not stimulate growth in Logan passenger demand above and beyond the rates that would have occurred absent proposed Runway 14/32.

Total door-to-door trip time for an average Logan passenger is more than 6 hours, including airport access and egress, waiting time before the flight, and actual flight time. The average delay savings that would result from the implementation of the Preferred Alternative are not of a magnitude that would induce passengers to make trips that they would otherwise not have taken.

For the reasons described above, the Preferred Alternative will not result in induced passenger or flight demand at Logan. Instead, growth in demand will be principally driven by local and national economic conditions and by competition and pricing within the airline industry. In any event, the broad range of forecasts considered in the Airside Project operational and environmental analyses encompass the impacts that would be associated with any growth scenario.

4.3 Preferential Runway Advisory System (PRAS)

Logan's Preferential Runway Advisory System (PRAS) goals underlie the delay and environmental modeling of the No Action (Base Case) and Action alternatives presented in the Airside Project Draft EIS/EIR. The EOEI Secretary requested that Massport broaden the discussion of PRAS in the Final EIR to demonstrate that the PRAS objectives provide a valid basis for the operational and environmental analyses. Logan's PRAS program is a set of recommended targets for FAA runway assignments. The objectives of PRAS are: a) to reduce noise exposure for the most highly impacted communities (i.e., those within the 70 and 75 dB DNL contours) by distributing noise impacts in accordance with runway utilization goals established jointly by Massport, the FAA, and community representatives; (b) to provide short-term relief from continuous aircraft operations over neighboring communities; and (c) to maximize use of overwater aircraft routings.

This section responds to the comments of the Secretary and other reviewers by presenting the historical context of the development of PRAS. This section also examines current and historic land use patterns and residential densities among the affected communities to determine whether they have remained relatively unaltered since the PRAS Program was initially developed. Finally, this section reviews historic levels of PRAS achievement to support its utility as the basis for projecting future runway utilization at Logan.

4.3.1 History of Preferential Systems at Logan

In 1968, the FAA authorized formal and informal runway use programs for noise relief. Following FAA authorization, preferential runway procedures with simple priority selection methods were initiated at Logan. Since that time, Massport, in conjunction with the FAA and representatives of surrounding communities, has continued to study and refine the goals and methodology for implementing PRAS.

Between 1980 and 1983, formal PRAS goals were established by the PRAS Advisory Committee. This committee was composed of representatives from Massport, the FAA, airlines, and 12 neighboring communities. The first computerized PRAS system was installed at Logan in 1983. Since that time, two major enhancements to the PRAS computer

system have been implemented at Logan: Enhanced PRAS in 1993 and Revised PRAS in 1996. These enhancements were designed to improve the conformance and use of the PRAS system by FAA controllers, and ultimately lead to improved achievement of the PRAS goals. As described later in this chapter, the PRAS enhancements have been accompanied by improvements in PRAS conformance at Logan.

4.3.2 PRAS Objectives and Goals

The PRAS Advisory Committee established the objectives of the system at the beginning of the original development between 1980 and 1983:

- Reduce noise exposure on populations residing in the most highly impacted communities, without significantly increasing the impact on any populated area within the day-night sound level (DNL) contour of 65 dB; and
- Maximize the use of runway 15R for overwater departures and 33L for overwater arrivals.

The PRAS goals are one of the criteria used for runway selection. The committee determined that the PRAS goals should provide a more equitable distribution of aircraft noise over the long-term (i.e. annually), and offer short-term relief from excessive operations over individual neighborhoods.

4.3.2.1 Long-Term Goals

To quantify the long-term noise goals, the committee reached a consensus on annual runway end use percentages in terms of equivalent jet operations. Equivalent operations include all daytime (7:00 AM to 10:00 PM) jet flights, plus nighttime (10:00 PM to 7:00 AM) jet operations multiplied by a factor of ten. This is consistent with the methodology for computing DNL, in which 10 dB are added to nighttime operations. The annual runway end use goals are shown in Table 4.3-1.

PRAS maintains a continuous count of the jet operations on each runway end for the most recent twelve-month period. Whenever a new recommendation is needed, it checks the wind and weather conditions and the expected demand level, and then identifies runway combinations which are available to meet these requirements. If there is more than one choice available, the combination that will produce the best match with the annual and short-term goals is recommended.

Table 4.3-1
PRAS Goals for Effective Jet Aircraft Runway Use

Runway End	PRAS Effective Usage Goals	
	Arrivals	Departures
4R/L	21.1%	5.6%
9	0.0%	13.3%
15	8.4%	23.3%
22L/R	6.5%	28.0%
27	21.7%	17.9%
33	42.3%	11.9%

Note: PRAS goals are stated in terms of effective jet operations which exclude non-jet flights, but which multiply each nighttime (10:00 PM to 7:00 AM) operation by a factor of 10. Each nighttime jet operation is therefore equivalent to ten daytime jet operations.

4.3.2.2 Short Term Goals

In order to provide temporary relief to neighborhoods impacted by regular overflights during single or multi-day periods, the PRAS Advisory Committee established two short-term goals for the system in addition to the annual goals:

- Provide relief from excessive dwell (more than seven hours of operations over a given area during any day between the hours of 7:00 AM and midnight); and
- Provide relief from excessive persistence (more than 23 hours of operations over an area between 7:00 AM to midnight during a period of three consecutive days).

In contrast to the annual goals that count the number of equivalent operations on a runway, dwell and persistence are measured by the number of hours that a given area is subjected to jet aircraft overflights. The PRAS Advisory Committee designated eight runway combinations for computing the effects of dwell and persistence on the communities. The dwell and persistence areas are defined by community as shown in Table 4.3-2.

Table 4.3-2
PRAS-Defined Dwell and Persistence Areas

Runway	Areas
4L&R Arrivals	South Boston (Farragut Street), Dorchester, Quincy, Milton, and Braintree
33L Arrivals	Boston Harbor, Hull
15 Departures	Boston Harbor
22 L&R Departures	South Boston (Farragut Street), Boston Harbor
27 Departures	South Boston (Fan Pier), Roxbury, and Jamaica Plain
4L&R Departures Plus 22L&R Arrivals	East Boston (Bayswater, Orient Heights), Winthrop (Court Road), and Revere
9 Departures plus 27 Arrivals	Winthrop (Point Shirley), and Boston Harbor
33 Departures plus 15 Arrivals	East Boston (Eagle Hill), Chelsea, Everett

4.3.2.3 PRAS Nighttime Routing Preference

One of the primary objectives of the PRAS system is to maximize the use of Runway 15R for overwater departures and 33L for overwater arrivals. While the annual goals alone attempt to maximize these operations, PRAS has additional nighttime preferences. Between the hours of 12:00 AM and 6:00 AM, the noise abatement procedures followed by the FAA controllers specify set runway priorities. Whenever possible, controllers will simultaneously use 33L for arrivals and 15R for departures. This opposite direction configuration is available only under VFR conditions with clear runways, and long separation requirements limit capacity; however, this configuration directs all operations over the water, reducing noise impacts and increasing PRAS goal achievement. Dwell and persistence are ignored at night so that this configuration can be used extensively, and when weather permits, controllers typically use this configuration for the full six-hour period.

4.3.3 Continued Validity of PRAS Goals

Although PRAS's long- and short-term goals were first developed nearly 20 years ago, land use patterns and population growth during the intervening years provide no evidence to support any change in the established preferences.³ For example, Figures 4.3-1 and 4.3-2 depict major land use categories within the project study area at the approximate time when the goals were established and for a more recent period, respectively.

▼
3 In 2000, the Citizens Advisory Committee (CAC) voted to withdraw its support of the PRAS goals.



Legend

No Action Alternative 29M Low
60, 65 and 70 DNL

- 1985 Land Use
- Single Family Residential
 - Multi-family Residential
 - Commercial
 - Industrial
 - Golf, Playgrounds, Stadiums
 - Open Land, Urban Open
 - Forest
 - Wetland
 - Water
 - Transportation
 - Various



0 0.5 1 1.5 Miles



Figure 4.3-1

1985 Land Use

Source: Harris Miller Miller & Hanson





Legend

No Action Alternative 29M Low

60, 65 and 70 DNL

1991 Land Use

- Single Family Residential
- Multi-family Residential
- Commercial
- Industrial
- Golf, Playgrounds, Stadiums
- Open Land, Urban Open
- Forest
- Wetland
- Water
- Transportation
- Various



0 0.5 1 1.5 Miles



Figure 4.3-2

1991 Land Use

Source: Harris Miller Miller & Hanson

The information was obtained from MassGIS, a state organization that collects land use data and updates when it is feasible. A comparison of the two figures shows there has been little if any conversion to or away from residential use. Thus, the major residential areas that were of concern to the communities and Massport when PRAS goals were first adopted in the early 1980's are still of concern today. There have been no shifts of major residential areas.

Supplementing this information is Table 4.3-3, which shows how residential population within different noise-impacted communities has changed over time. Using US Census data and a single set of noise contours from the Airside Project Draft EIS/EIR to define a fixed area, the table compares the numbers of people, by community, that reside within 5 dB increments of exposure. The earlier population data reflect the distribution of people around Logan when PRAS goals were first adopted; the later population data reflect a more current distribution.

While the counts show a modest overall increase in population within the DNL 60 contour over a ten-year period, the changes do not always occur uniformly by community. What they do show, however, is that no major redistribution of population has occurred. Not one community has changed its ranking relative to the others over the ten-year period. Collectively, these unchanged land use patterns and population distributions support the continued validity of the original PRAS goals.

4.3.4 Historic PRAS Conformance

Statistics on the conformance of the PRAS system have been collected since the original system was installed in 1983. In order to interpret those statistics, it is important to understand the fundamental changes that have occurred in the PRAS system in the 16 years since the original installation.

4.3.4.1 PRAS Revisions

While there have been numerous minor improvements, there are three primary versions of PRAS that have been used at Logan over the years:

- **Original PRAS:** This version of the program, installed in 1983, incorporated the original goals and simple runway selection logic.
- **Enhanced PRAS:** This version of the program, installed in 1993, was designed to try to improve PRAS goal achievement.
- **Revised PRAS:** This version of PRAS, which is currently in use, incorporates automated data input to greatly enhance usability.

Table 4.3-3
Comparison of Population Counts for the 29M Low and the No-Action Alternative
Using 1980 and 1990 Census Data¹

Noise-exposed Community	1980 Census Counts			
	DNL greater than 60 dB	DNL greater than 65 dB	DNL greater than 70 dB	DNL greater than 75 dB
East Boston	25,404	7,235	595	0
Winthrop	12,700	4,686	1,182	155
Chelsea	7,997	2,828	0	0
South Boston	6,215	945	0	0
Revere	5,596	3,669	0	0
Deer Island ²	499	0	0	0
Everett	215	0	0	0
Total	58,626	19,363	1,777	155

Noise-exposed Community	1990 Census Counts			
	DNL greater than 60 dB	DNL greater than 65 dB	DNL greater than 70 dB	DNL greater than 75 dB
East Boston	26,035	7,117	437	58
Winthrop	11,799	4,291	1,084	199
Chelsea	10,232	3,056	0	0
South Boston	6,010	66	0	0
Revere	5,227	3,001	0	0
Everett	220	0	0	0
Deer Island ²	0	0	0	0
Total	59,523	17,531	1,521	257

¹ Communities are ordered from highest to lowest according to the number of residents within the 60 dB DNL noise contour.

² Deer Island's prison population was included in the 1980 Census but in light of impacts under 65 dB was never considered a major factor in developing PRAS goals. Its inmates have since been relocated to accommodate the new Boston Harbor wastewater treatment facility.

4.3.4.2 Original PRAS

The original PRAS at Logan was installed in 1983 and was based on conditions that existed in 1981 or before. These conditions included aircraft activity levels and fleet mix, FAA procedures, and technology (both aviation and computer). Although the system represented the state-of-the-art at the time it was designed, the FAA and Massport recognized in the late 1980s that it had limitations.

To be effective PRAS must be able to identify runway configurations that are capable of serving given levels of demand and decide which one among the eligible configurations to recommend. The original PRAS had only limited technical flexibility to perform these tasks effectively. In particular, it was designed with a fixed daily demand schedule from 1980-82

operations, and it had no automatic capability to update this schedule to adjust to the changes in demand that accompanied the large growth in commuter operations.

4.3.4.3 Enhanced PRAS

The enhanced PRAS was installed in 1993 to address the limitations in the original PRAS and to provide flexibility to accommodate changes in airport operations and/or FAA procedures. It was designed as a forward-looking system to assist the FAA in planning operations throughout a shift. It operated 24 hours per day, and provided a choice of recommended eight-hour configuration plans to the FAA operator, who could modify the plan as needed. The enhanced PRAS incorporated an estimate of the controller workload required to change configurations into its planning logic.

Enhanced PRAS was tested for approximately nine months by the FAA in the Logan Control Tower. While Enhanced PRAS addressed many of the concerns the FAA raised about the original system, the new system required controllers to manually enter and continually update data on current weather conditions, weather forecasts, traffic demand, runway closures, and runway surface conditions. This data entry imposed additional controller workload on top of already demanding primary air traffic control activities.

4.3.4.4 Revised PRAS

The current system, revised PRAS, was installed in 1996 to reduce the effort required for controllers to use the system. Revised PRAS was linked to the Systems Atlanta Information Display System (SA-IDS), and the inputs for traffic demand, current weather, weather forecasts, runway closures, and runway conditions were provided automatically. This automated data entry has led to better system conformance and PRAS goal compliance.

4.3.4.5 Historic Achievement of PRAS Goals

This section examines historic PRAS conformance at Logan from three perspectives:

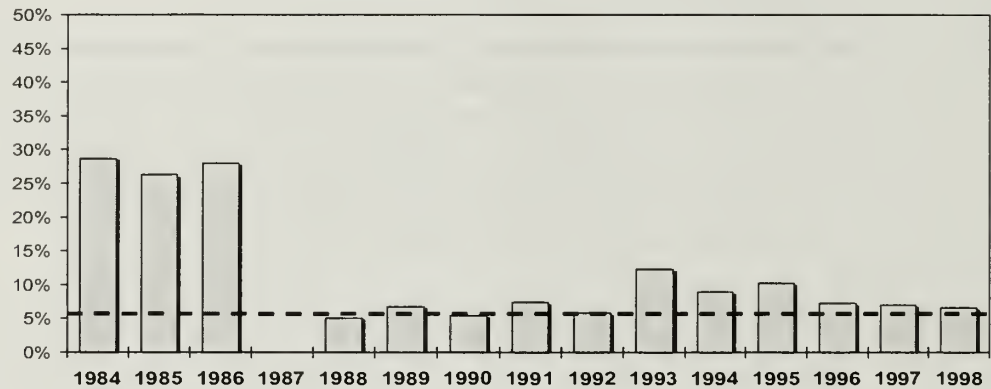
- Individual runway utilization compared to the PRAS annual goals;
- A PRAS performance index that measures the aggregate achievement of annual goals across all runways; and
- Comparisons of historic runway utilization to the predicted usage based on the model.

Historic Utilization of Individual Logan Runways Compared to PRAS Goals

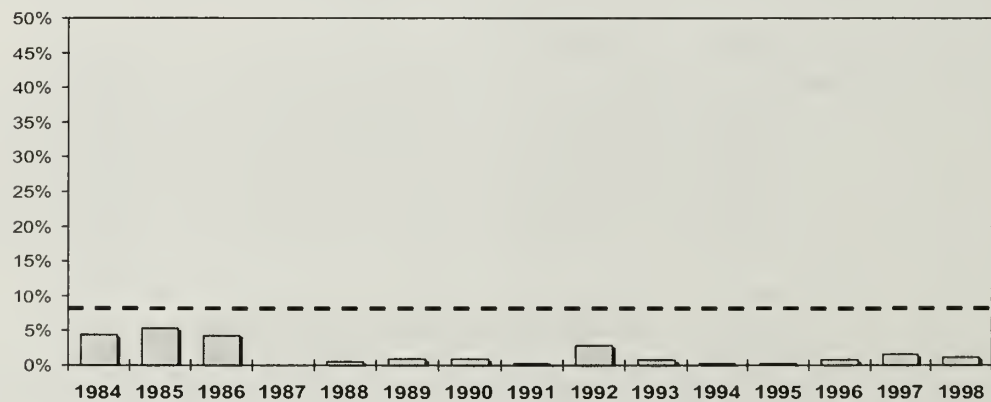
Figures 4.3-3 and 4.3-4 summarize the historic levels of PRAS achievement relative to the annual goals for individual Logan runways from 1984 through 1998. While there is a wide variation in conformance relative to the goals, this is expected due to variations in weather conditions, fleet mix, and FAA operational techniques (i.e., Land and Hold-Short Operations, or LAHSO, on 22L and 27) from year to year. Other factors such as airfield construction and airline scheduling also have an impact. Still, a number of conclusions can be drawn.

Figure 4.3-3
Equivalent Jet Arrival Operations by Runway and Year

Arrive 4 (Goal = 21.1%)



Arrive 15 (Goal = 8.4%)



Arrive 22 (Goal = 6.5%)

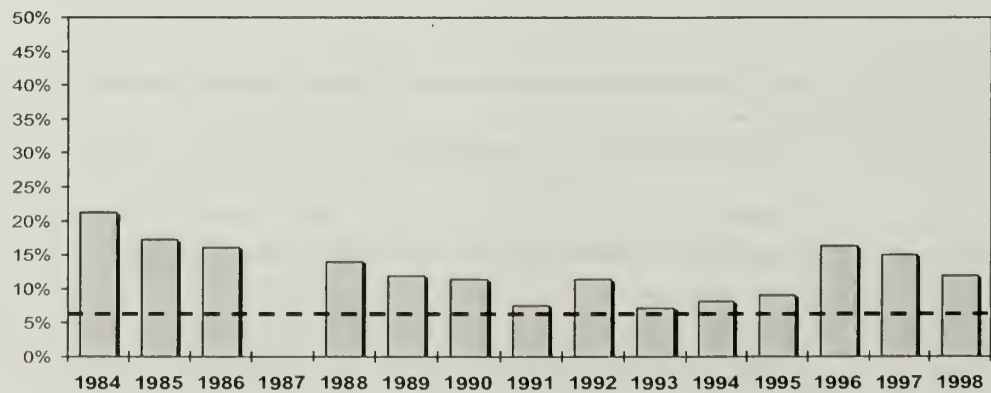
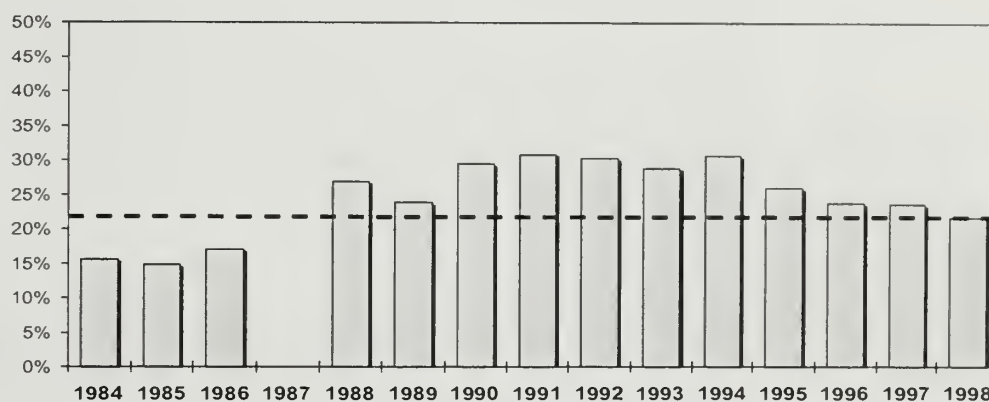
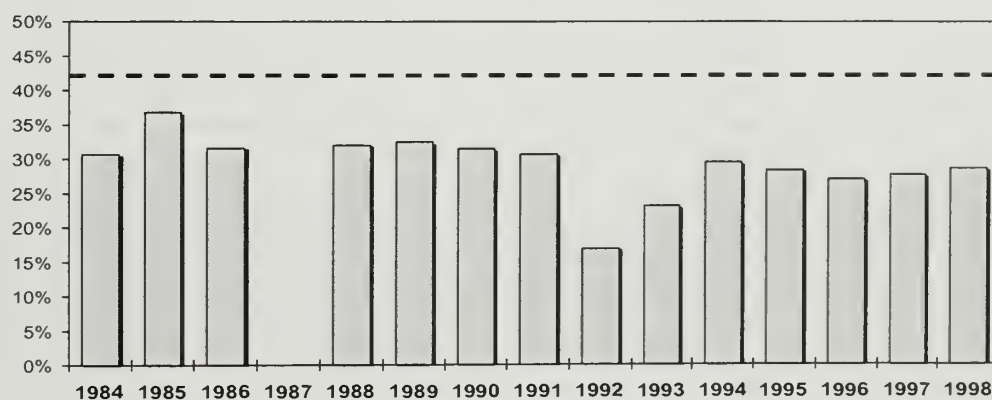


Figure 4.3-3 (Cont'd.)
Equivalent Jet Arrival Operations by Runway and Year

Arrive 27 (Goal = 21.7%)



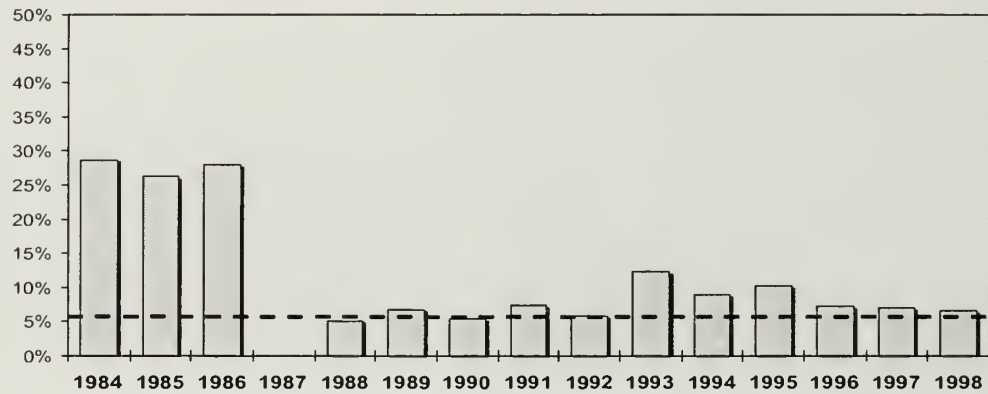
Arrive 33 (Goal = 42.3%)



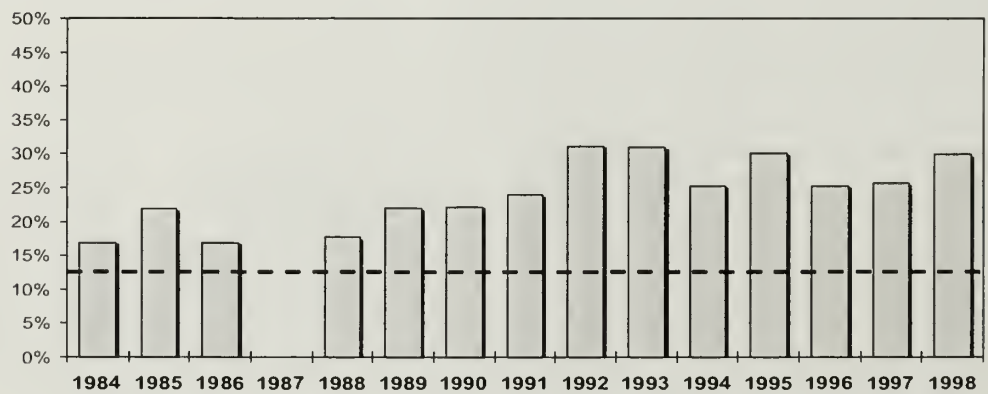
Note: 1987 data unavailable

Figure 4.3-4
Equivalent Jet Departure Operations by Runway and Year

Depart 4 (Goal = 5.6%)



Depart 9 (Goal = 13.3%)



Depart 15 (Goal = 23.3%)

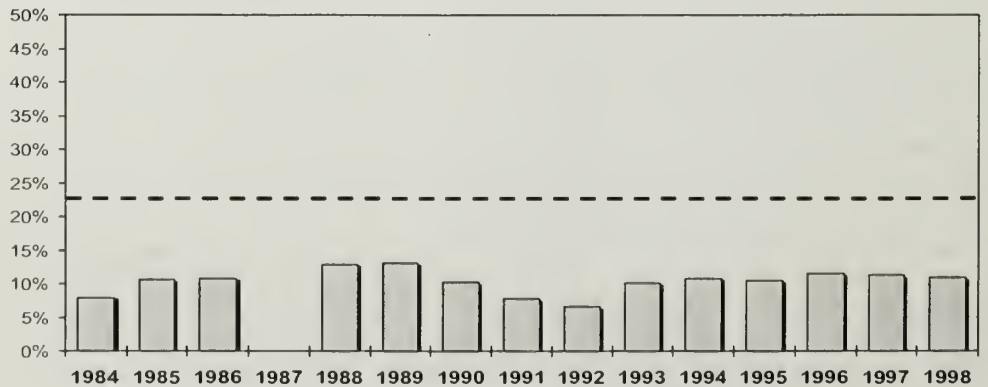
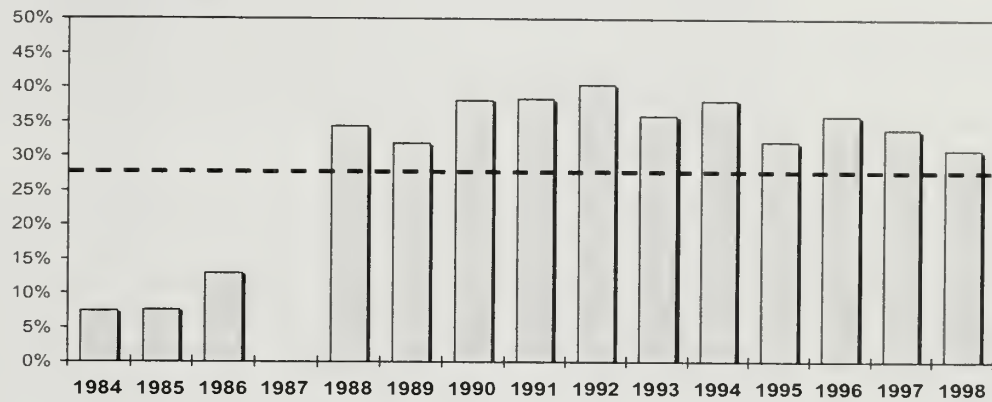
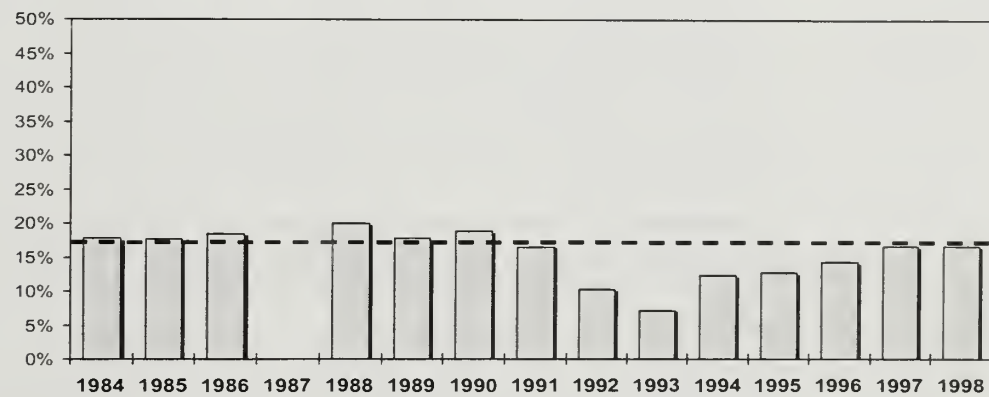


Figure 4.3-4 (Cont'd.)
Equivalent Jet Departure Operations by Runway and Year

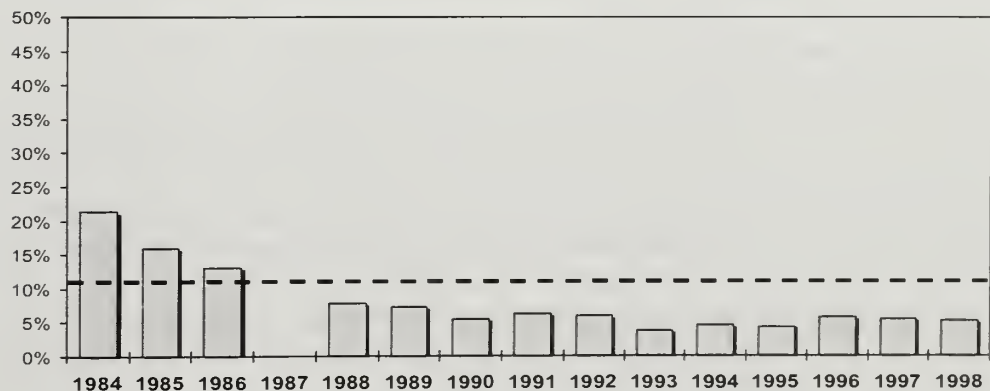
Depart 22 (Goal = 28.0%)



Depart 27 (Goal = 17.9%)



Depart 33 (Goal = 11.9%)



Note: 1987 data unavailable

For arrivals, it is clear that Runway 4 arrivals have always exceeded the goal, and that conformance with the goal declines with higher demand and peaking, as in 1993. This is expected since Runway 4 arrivals correspond to the highest capacities at Logan. Conversely, arrivals on Runway 15 and Runway 33 have always been well short of the goals as these runways exhibit lower operational capacities. Since 1988, Runway 27 arrivals have been above the goal whereas they were formerly below it. This change is due to the FAA implementation of land-and-hold-short operations (simultaneous landings on Runway 22L and Runway 27 while departing on Runway 22R), which increased the capacity of the configuration while operating under Visual Meteorological Conditions (VMC).

For departures, Runway 9 departures have always exceeded the goals, due to that runway's simultaneous use with Runway 4L/R arrivals. Runway 22 departures began to exceed the goals in 1988 with implementation of land-and-hold-short operations. Runway 4 and 27 departures have remained near the goals for the most part, but Runway 4 departures increased and Runway 27 departures declined during the highly peaked conditions around 1993. For the past ten years, both Runway 15 and Runway 33 departures (much like the arrivals) have been below the target levels.

Aggregate PRAS Achievement Across All Logan Runways

While it is useful to view the individual runway end use over time, overall PRAS conformance may also be judged by examining all runways simultaneously, especially considering the variability of weather, demand, and other factors. In order to evaluate overall PRAS achievement over time, a PRAS Performance Index (PPI) was developed that represents the performance of all runways relative to the annual goals. The PPI measures deviations⁴ from the PRAS goals for each Logan runway, the same measure used in the PRAS selection algorithm to determine the best configuration relative to the annual goals on an ongoing basis. Because the PPI measures differences from the runway utilization goals, lower values represent better PRAS achievement. Figure 4.3-5 presents the PPI relative to the number of total annual Logan operations for the period from 1984 through 1998.

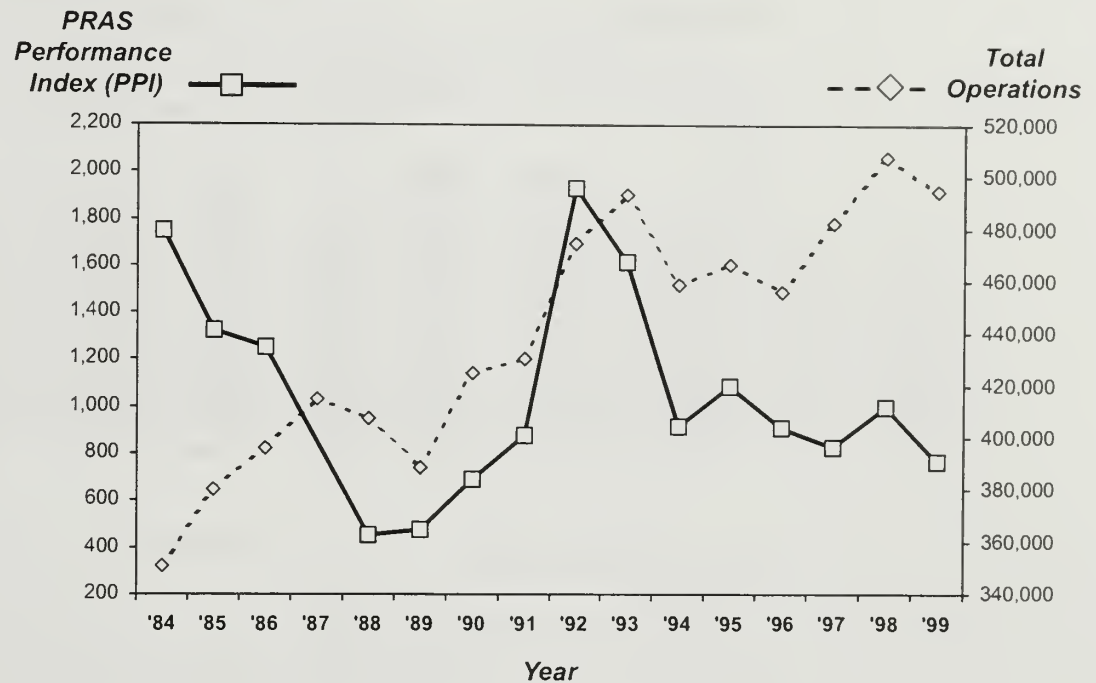
The PPI will tend to increase as operations grow since increasing flight levels can limit controller flexibility in selecting runway configurations. While this is generally true, system enhancements have helped improve PRAS achievement, despite growing Logan activity levels, as described below:

- When PRAS was originally installed, there was an immediate improvement in goal conformance during the first few years.
- From 1988 through 1992, the original PRAS became less effective (for reasons explained above), and PRAS goal deviations increased along with airport operations.
- Performance relative to the goals has improved considerably since then with the installation of enhanced PRAS in 1993 and revised PRAS in 1996.

These changes in PRAS performance demonstrate that the FAA is striving to achieve the best possible PRAS goal achievement and has made considerable progress in this area.

▼
.....
4 Calculated as the sum of the squared deviations from the stated PRAS goals.

Figure 4.3-5
PRAS Performance Index



Notes: 1987 PRAS performance information not available; PPI = Sum of squared deviations

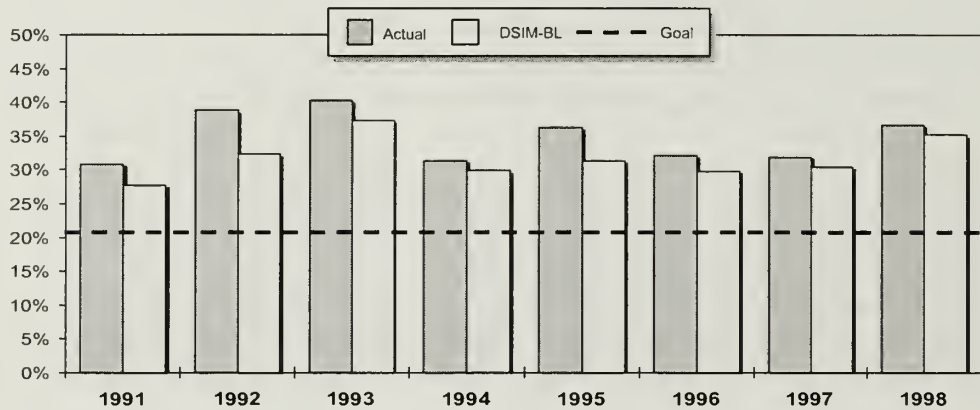
4.3.4.8 Historic PRAS Performance Compared to Model Predictions

The operational and environmental analyses conducted for the Airside Project Draft EIS/EIR and the Supplemental Draft EIS/Final EIR do not assume perfect achievement of PRAS goals. Instead, the DELAYSIM model selects runway configurations based on hour-to-hour demand levels and the capacities of available runway configurations. It is only when more than one runway combination has sufficient capacity to accommodate flight demand that the PRAS long- and short-term goals are considered in the runway selection process.

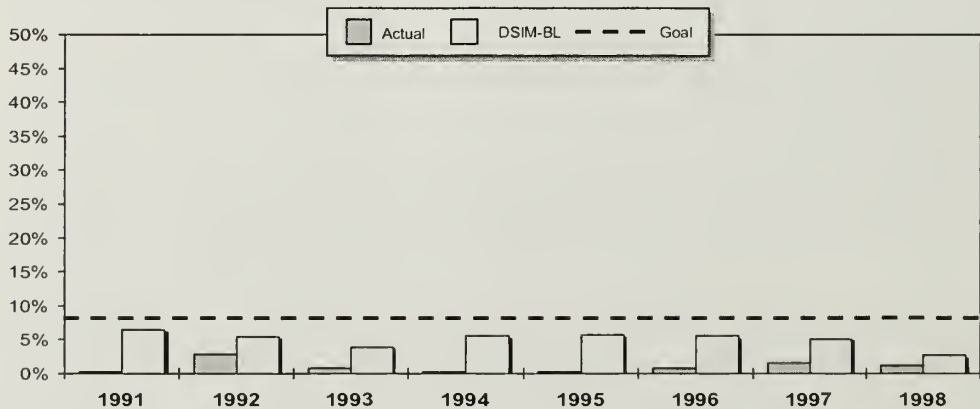
In order to evaluate how closely DELAYSIM would have simulated historic runway utilization patterns, Logan flight activity patterns between 1991 and 1998 were modeled using reported weather patterns for each individual year. Figures 4.3-6 and 4.3-7 show the historic utilization of each Logan runway by year, and compare this to the predicted results based on DELAYSIM modeling. The comparative analysis indicates that for most Logan runways, the differences between actual and simulated utilization are small, and that the margin between actual and simulated runway usage has narrowed over time. This comparison supports the use of PRAS goals within the operational analysis for environmental review purposes.

Figure 4.3-6
Modeled vs. Actual Equivalent Jet Arrivals by Runway and Year

Arrive 4 (Goal = 21.1%)



Arrive 15 (Goal = 8.4%)



Arrive 22 (Goal = 6.5%)

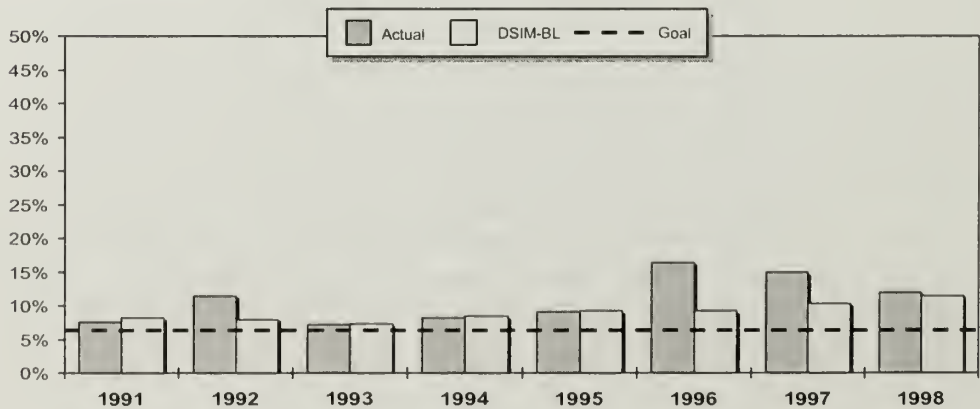
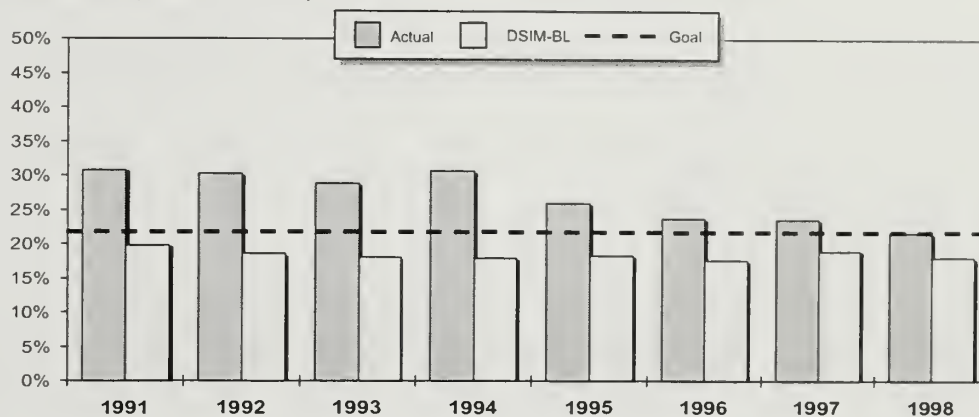


Figure 4.3-6 (Cont'd.)
Modeled vs. Actual Equivalent Jet Arrivals by Runway and Year

Arrive 27 (Goal = 21.7%)



Arrive 33 (Goal = 42.3%)

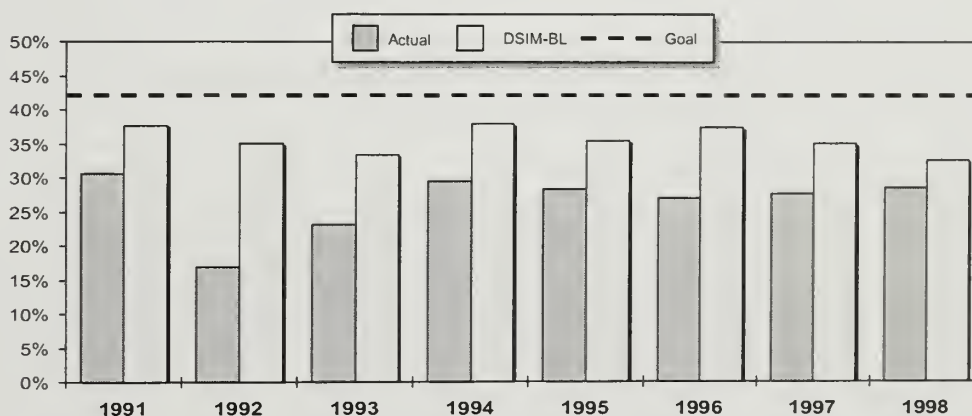
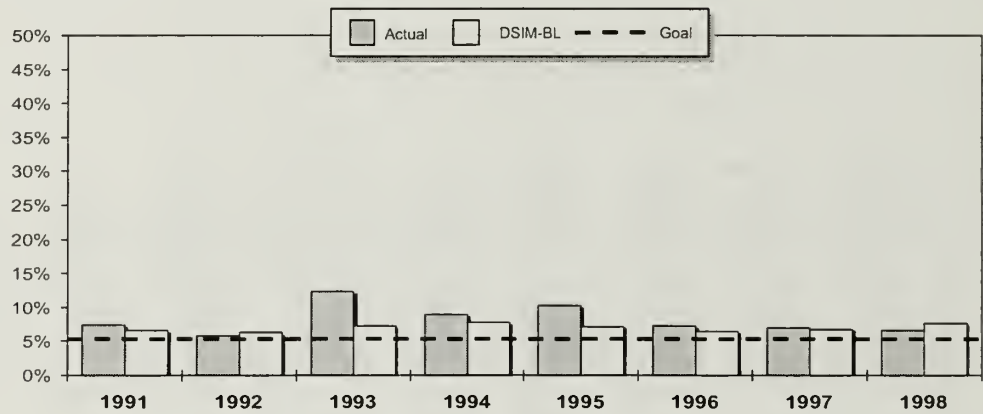
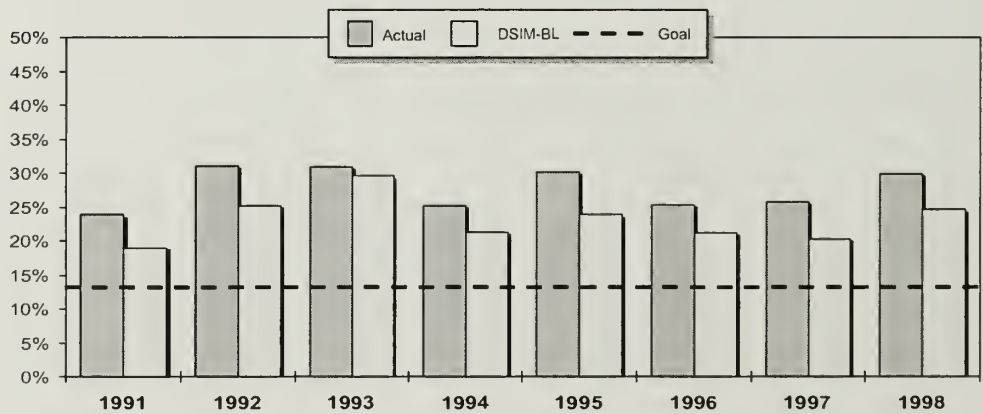


Figure 4.3-7
Modeled vs. Actual Equivalent Jet Departures by Runway and Year

Depart 4 (Goal = 5.6%)



Depart 9 (Goal = 13.3%)



Depart 15 (Goal = 23.3%)

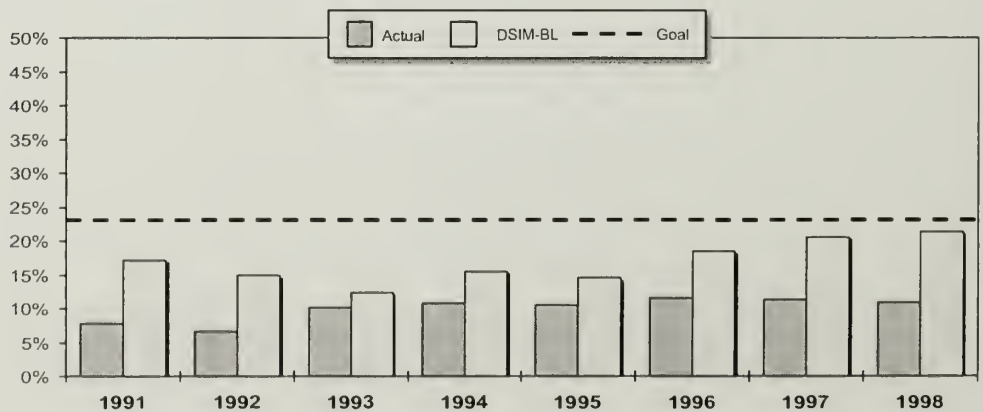
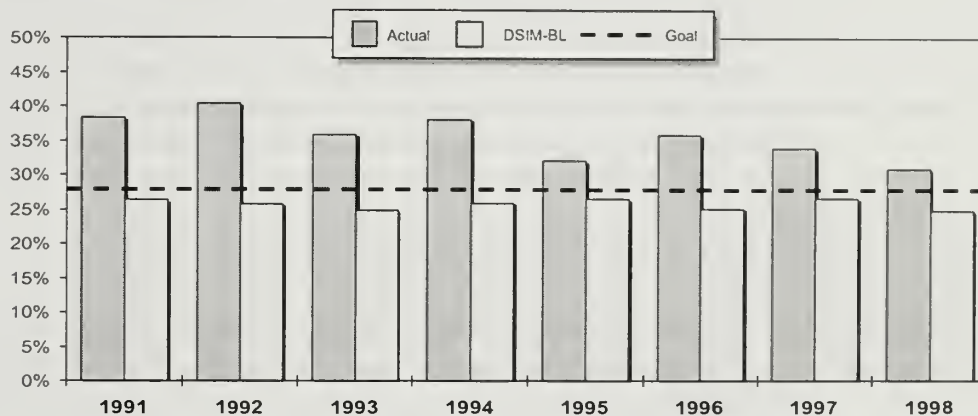
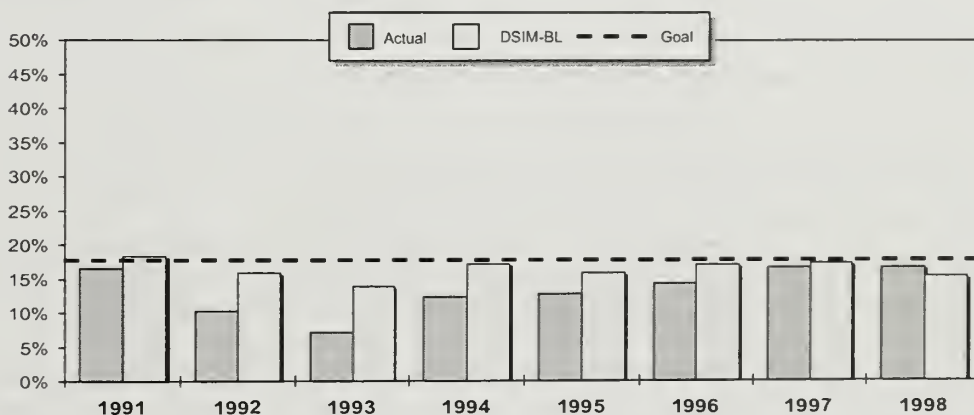
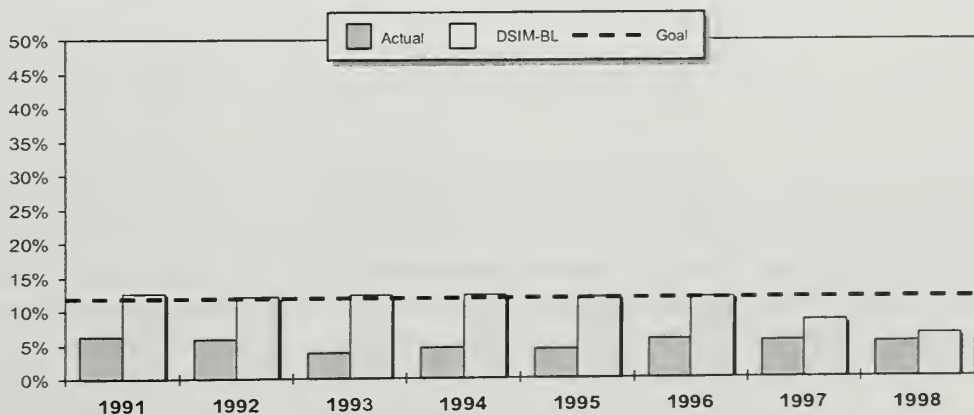


Figure 4.3-7 (Cont'd.)**Modeled vs. Actual Equivalent Jet Departures by Runway and Year****Depart 22 (Goal = 28.0%)****Depart 27 (Goal = 17.9%)****Depart 33 (Goal = 11.9%)**

4.3.5 PRAS Reporting and Monitoring

Comments on the Airside Project Draft EIS/EIR and the May 7, 1999 EOE A Certificate requested that quarterly and annual PRAS achievement reports be developed, that the distribution list be broadened, and that results be reported in the GEIR/ESPR. Design of monitoring protocols was also requested. Massport currently monitors PRAS performance at Logan and reports results both internally, to the FAA, and to requesting members of the general public. This section describes the PRAS Monitoring System developed by Massport and describes how PRAS monitoring and reporting will be expanded in response to these requests.

4.3.5.1 Current PRAS Reporting and Monitoring

The PRAS computer system was designed to track a number of statistics and to generate reports comparing Logan runway utilization patterns to the PRAS goals. The PRAS monitoring program produces seven regular reports on PRAS performance, which are described in greater detail below:

- **Monthly Operations:** This report presents the average daily jet arrivals and departures by runway and time of day for any given month. It also shows average day, night, equivalent, and total operations by month relative to the annual PRAS goals.
- **Monthly Utilization:** This report shows the hours and maximum consecutive hours of arrival and departure runway use for each day of a given month. It presents the total monthly and average daily utilization of runways in terms of hours of jet arrivals and departures. It also shows a summary of the hours of runway use by weather condition.
- **Monthly Dwell and Persistence:** The report presents the hours of dwell and persistence by noise area for each day of the month as well as the daily average dwell and persistence and goal exceedence.
- **Monthly Summary:** The summary highlights the three reports described above. It compares jet operations by runway with annual goals, shows the monthly and average day hours of runway use as well as consecutive hours of use. It also summarizes the monthly dwell and persistence conformance.
- **Monthly 33L/15R Utilization:** This report shows the number of hours between midnight and 6:00 AM during which the 33L/15R configuration was both recommended and used. It also presents the use of 33L and 15R individually during nocturnal hours.
- **Annual Utilization:** For the specified calendar year, this report presents the average and maximum consecutive hours of jet use by runway end and month. It also presents total and average annual utilization by runway and weather condition.
- **Annual Dwell and Persistence:** The final report presents the monthly dwell and persistence averages as well as annual averages and the average annual exceedence.

These seven reports are prepared by the Massport Noise Abatement Office on a monthly and annual basis. On a quarterly basis, the Massport Quarterly Noise Reports are distributed to Massport staff, FAA employees, and other requesting parties such as community

members. These reports include measured sound levels, runway use statistics, FAA traffic totals, and the late night runway use report. The quarterly report also includes a PRAS monthly summary report (a version of the summary reported by the PRAS system itself, but generated directly from the ARTS data), which includes day/night hours of jet use by runway, day/night jet operations by runway, monthly conformance relative to the annual PRAS goals, and conformance relative to the annual goals for the previous twelve months. In addition to the printed reports, both the FAA and the Massport Noise Abatement Office have real-time displays showing the rolling 12-month conformance relative to the PRAS goals as well as the current dwell and persistence counts.

In response to the EOECA Certificate and public comments, the Massport Quarterly Noise Reports will be expanded to include all of the PRAS reports generated by the system, and the distribution list will be expanded. The annual reports on runway utilization, dwell and persistence will also be included in upcoming ESPRs and annual Environmental Data Reports (EDRs). In addition, Massport and the FAA have agreed to development of a new report that will track the attainment of the PRAS recommendations.

4.3.6 Extending PRAS Overwater Nighttime Routing Preference

One potential mitigation measure proposed in the comments on the Airside Project Draft EIS/EIR is to begin the nighttime overwater routing preference before 12:00 AM or extend it beyond 6:00 AM. This would reduce late evening and early morning flights over impacted communities.

While the use of the 33L/15R configuration is environmentally beneficial, its low capacity is a significant operational limitation. Controllers must maintain a minimum of eight miles of separation between opposite direction aircraft, limiting configuration utilization to periods of very low demand. The first step in evaluating the feasibility of extending the nighttime period is analysis of the demand profile. Table 4.3-4 presents the demand profile from 10:00 PM to 7:00 AM in 15-minute increments. Operations are distributed fairly evenly within individual hours from 10:00 PM to 12:00 AM and from 6:00 AM to 7:00 AM. The hourly demand drops from 43 operations at 10:00 PM to 22 at 11:00 PM and 13 operations at 12:00 AM. Conversely, there were only 6 average operations during the 5:00 AM hour increasing to 46 operations in the 6:00 AM to 7:00 AM period.

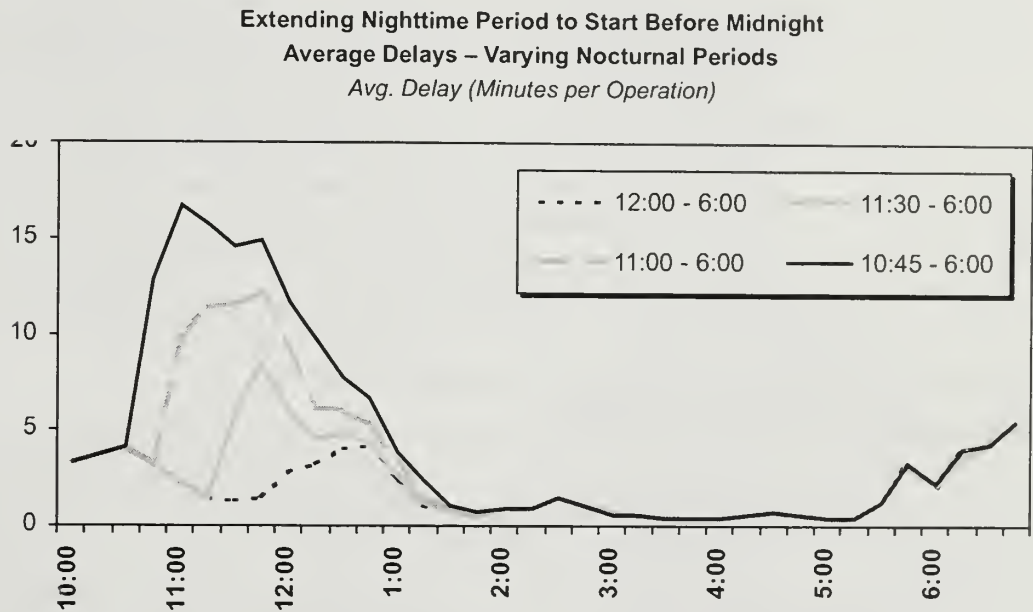
In order to determine the feasibility of extending the nocturnal period, the DELAYS model was used to examine an average August weekday in 1998 broken down into 15-minute increments. This analysis assumed VFR weather and calm winds, conditions under which the preferred nighttime configuration would be available. An hourly saturation capacity of 20 operations while using Runway 33L/15R simultaneously was estimated. Figure 4.3-8 shows the average delays from various extended nocturnal periods ranging from 10:00 PM to 7:00 AM. Beginning the nocturnal period before 11:00 PM or extending it past 6:15 AM would produce excessive delays. It should be noted that delays in the 6:00 AM hour could propagate throughout the day while delays in the 11:00 PM hour are quickly dissipated due to the low demand after midnight.

Table 4.3-4
Nighttime Operations (10:00 PM to 7:00 AM)

Time			Average Day Operations	
Start		End	Quarter-Hourly	Hourly
22:00	-	22:14	10.7	
22:15	-	22:29	11	
22:30	-	22:44	11.9	
22:45	-	22:59	9	42.6
23:00	-	23:14	6.4	
23:15	-	23:29	4.9	
23:30	-	23:44	5	
23:45	-	23:59	5.5	21.8
24:00	-	00:14	2.7	
00:15	-	00:29	3.3	
00:30	-	00:44	3.9	
00:45	-	00:59	3.4	13.4
01:00	-	01:14	1.8	
01:15	-	01:29	1.2	
01:30	-	01:44	0.9	
01:45	-	01:59	0.7	4.5
02:00	-	02:14	1.0	
02:15	-	02:29	0.9	
02:30	-	02:44	1.6	
02:45	-	02:59	1.0	4.5
03:00	-	03:14	1.0	
03:15	-	03:29	1.0	
03:30	-	03:44	0.7	
03:45	-	03:59	0.7	3.3
04:00	-	04:14	0.6	
04:15	-	04:29	0.8	
04:30	-	04:44	1.0	
04:45	-	04:59	0.7	3.1
05:00	-	05:14	0.5	
05:15	-	05:29	0.5	
05:30	-	05:44	1.4	
05:45	-	05:59	3.2	5.6
06:00	-	06:14	8.6	
06:15	-	06:29	12.4	
06:30	-	06:44	11.5	
06:45	-	06:59	13.5	46.0

Note: ARTS Data represents July 98 through June 99 and was processed by FTA and Massport.

Figure 4.3-8
Minutes of Average Delay by Nocturnal Period and 15-minute Increment



While the official preferential runway use policy for Logan states that the FAA will observe the nighttime priorities from 12:00 midnight to 6:00 AM, controllers currently try to switch to the Runway 33L/15R configuration as soon after 11:00 PM as demand permits. Massport will encourage the FAA to continue this practice of initiating overwater routing preferences as soon after 11:00 PM as practicable. It is important to note, however, that controllers can only employ the 33L/15R nighttime configuration under favorable wind and weather conditions, which limits its use to about 60 percent of the time. In addition, the extended period would only be useable if there were no delays remaining from the daytime period. Finally, it is worth noting that the takeoff and climb performance of modern Stage 3 jets is vastly improved since the nighttime priorities were established, and that departures represent a small percentage of the operations from 11:00 PM to midnight. Hence, most of the noise benefit can be achieved by using 33L for overwater arrivals, whether or not 15R can be used for departures based on the demand level.

4.4 Delay Modeling Approach

As discussed in Chapter 1, existing delay measures such as the FAA OPSNET and CODAS or the DOT ATCR have specific purposes and uses, but none provides an accurate measurement of delays caused by conditions at Logan. Most importantly, they do not provide any information on future delays, either with or without proposed airfield improvements. The only way to estimate airfield delays under alternative future scenarios is to model airfield operations under these conditions.

This section discusses the use of computer models for simulating airfield operations and delays in environmental impact analyses, and discusses the three specific models employed in the Airfield Improvements study.

4.4.1 Computer Modeling for Environmental Impact Studies

With current technology, computer models of airport operations provide the most accurate and useful estimates of airport delays for environmental planning. Computer models that simulate individual aircraft operations over a specified period of time are able to produce very detailed information on airport activity and delay statistics. Because these models calculate all aircraft movements and interactions, they are able to capture details that are not measured by published delay statistics, and they can isolate delays by cause or condition.

Table 4.4-1 summarizes the features and limitations of models available in the industry to estimate flight delays for airport planning. The table describes the three models (FLAPS, the Airport Machine, and DELAYSIM) that have been used in the Logan Airside Improvements Planning Project to estimate airfield capacities and delays, and to produce inputs to the environmental analyses. FLAPS and the Airport Machine were used to simulate runway/airspace and taxiway operations, respectively, for each Logan runway configuration. Other simulation models with similar capabilities are RDSIM, ADSIM, SIMMOD and TAAM. However, FLAPS and the Airport Machine have been specifically configured and validated for Logan operations, and both have been used for planning studies at various international airports around the world.

Table 4.4-1
Comparison on Computer Models for Airport Capacity and Delay

Model	Features	Limitations
FLAPS	Designed at MIT for Logan Detailed runway exit performance Multiple runway interactions Modest input data requirements Used at Boston, St. Louis, LaGuardia, Sydney, Amsterdam, others	Limited graphics. Excludes taxiway system.
Airport Machine	Detailed taxiway system ground movement logic. Detailed graphical presentation Used at numerous domestic and international airports	Excludes airspace system Complex data requirements
SIMMOD	FAA-sponsored development Covers taxiway, runway, airspace Used at numerous domestic & international airports	1-dimensional airspace capability Complex data requirements Inability to handle some common airport procedures
TAAM	Covers taxiway, runway, airspace High resolution 2D and 3D graphics Used at several major international airports	Very complex data requirements Requires special hardware Expensive to acquire and operate
ADSIM	Covers taxiway and runway operations Used by FAA Tech Center Used at several major US airports	Complex data requirements No aircraft landing & braking dynamics
RDSIM	Single or multiple runway operations. Used by FAA Tech Center Used at BOS and other major US airports	No graphical facilities. No aircraft landing & braking dynamics Single runway configuration
DELAYSIM*	Unique airfield utilization simulation Delays based on real weather patterns Detailed delay statistics Controller workload for runway changes Used at Boston, Amsterdam, and Sydney	Individual aircraft movements not simulated Runway selection priority required

* Indicates models used in Logan Airside Project Improvements Project

The DELAYSIM model provides a dimension of airfield modeling that is not available with any other tool. Two primary outputs of the airfield operations/delays analysis are average annual aircraft delays, which are used to measure the benefits of proposed improvements, and average annual runway utilization, which strongly influences the corresponding environmental impacts. Both runway utilization and delays are heavily influenced by the dynamic weather conditions at the airfield, which can vary significantly from year to year. To obtain delay results that account for dynamic variation yet are not biased by a specific year's weather, it is essential to analyze airfield operations under realistic weather patterns for several years and then average the results. DELAYSIM has this capability.

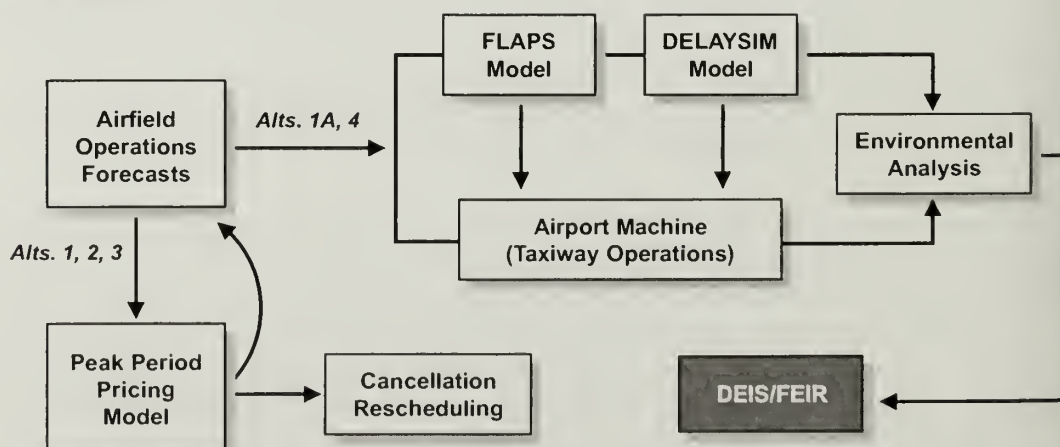
DELAYSIM is a unique model that simulates how the air traffic controllers select runways based on continuously varying demand and weather conditions. It was originally developed specifically for Logan during the enhanced PRAS project, and augmented by incorporating the MIT DELAYS model to estimate the aircraft delays. DELAYS is a dynamic queuing model for estimating expected delay, queue length and other statistics. DELAYSIM simulates the controllers' runway selection process hour-by-hour using historical weather observations. This procedure is repeated for each hour in a multi-year sequence of weather observations, and the results are averaged to produce the expected utilization and delays. The use of multi-year weather observations was particularly beneficial at Boston, where weather conditions can vary widely from year to year.

4.4.2 Airside Modeling Methodology

The airside delay modeling approach was specifically designed to measure historic and future aircraft operating delays by simulating operating conditions at Logan, and to estimate the reduction in delay that each of the proposed alternatives would produce. The models simulate the actual movement of individual aircraft from the approach fix to arrival runway to the gate for arriving aircraft, and from the gate to take-off runway to the departure fix for departing aircraft. Modeling at this high level of detail enables the delay model to generate inputs for the noise and air quality models, ensuring consistency between the estimates of future delays and environmental impacts.

Figure 4.4-1 provides an overview of the modeling approach used to calculate changes in delay and shows how the delay modeling components are linked to the models used to simulate taxiway operations and estimate environmental impacts. This diagram outlines the basic building blocks of the integrated modeling system and indicates the interactions between model components. The operational modeling methodology was described in detail in Chapter 4 of the Airside Project Draft EIS/EIR.

Figure 4.4-1
Delay Modeling Approach



4.5 Peak Period Pricing

Peak Period Pricing is intended to reduce delays caused when demand for airfield access exceeds airfield capacity over a sustained period as a result of airline overscheduling. It is an administrative option that raises the price of using the airfield during these defined peak periods. By raising the price of airfield access during peak periods, some existing aircraft operations would be discontinued or shifted to non-peak hours because the value derived from using Logan during these periods is exceeded by the new cost of doing so.

The methodology used to model and evaluate the impacts of Peak Period Pricing was fully described in the Airside Project Draft EIS/EIR. This section describes supplementary analyses performed for the Supplemental DEIS/FEIR. It includes an assessment of an illustrative exemption program designed to mitigate potential service disruptions at small communities. In addition, the discussion of Peak Period Pricing is expanded to consider potential impacts of the program on regional carrier fleet mix, and the possibility that Peak Period Pricing would result in increased regional airline reliance on alternate regional airports to provide connections from small communities to the national air transportation system.

While Peak Period Pricing is not included for immediate implementation, the delay analysis described later in this chapter indicates that this demand management strategy could represent a viable delay reduction measure under potential future conditions of airline overscheduling. In response to the EOECA Certificate, this section includes a description of a Peak Period Monitoring System that will be established by Massport to determine when and if airline overscheduling is emerging as a significant source of Logan delays. When warranted based on this ongoing schedule monitoring system, Massport will begin collaborative discussions with individual carriers in order to encourage increased scheduling efficiency at Logan. If successful, this initiative will reduce the likelihood that airline overscheduling will develop at Logan such that a Peak Period Pricing program would become necessary. If these discussions do not produce the necessary results, appropriate regulatory action will then be undertaken.

4.5.1 Background

Alternatives 1, 2 and 3 include Peak Period Pricing, which is defined in detail in Section 3.5. Peak Period Pricing differs from the other proposed improvements because it reduces delay by eliminating flights during periods of high demand, rather than by improving the airfield to allow for more efficient accommodation of existing flight demand.

The analysis of Peak Period Pricing was based on the introduction of a \$150 surcharge on flights arriving or departing Logan Airport during defined peak periods. The impacts of the program were most pronounced for regional carriers operating small aircraft in the 9- and 19-seat classes, because the fixed surcharge resulted in a significant cost increase on a per passenger basis. The implementation of Peak Period Pricing was forecast to produce flight cancellations in nonstop markets where profitability was substantially reduced.

Because many of New England's small- and medium-sized communities rely heavily on Logan for access to the national air transportation system, reductions in Boston service could have adverse economic consequences. These issues were addressed in Appendices F and G of the Airside Project Draft EIS/EIR which present case studies concerning the impact of Peak Period Pricing on selected Logan regional carriers and small communities. It is in response to concerns regarding market access that the illustrative small community exemption program is addressed in this Supplemental DEIS/EIR.

The delay reduction benefits that result from Peak Period Pricing were described in Chapter 4 of the Airside Project Draft EIS/EIR. The projected delay reduction impacts of Peak Period Pricing are based on forecast changes in flight schedules in response to the modified landing fee structure. The reductions in forecast annual Logan aircraft operations attributed to Peak Period Pricing are summarized below in Table 4.5-1 for the 29M Low Fleet and 37.5M High Fleet scenarios.

On an annual basis, Peak Period Pricing is estimated to reduce aircraft traffic at Logan by 4,000 annual operations under the 29M Low Fleet scenario and by 56,000 operations under the 37.5M High Fleet scenario. The table also illustrates the reduced level of annual aircraft operations for those Alternatives that include Peak Period Pricing as an improvement concept.

The cancellation rate associated with the High Fleet scenario is considerably greater than for the Low Fleet scenario, because the designated peak periods of the High Fleet scenario are longer, thereby producing a greater cost increase. The regional industry is also more competitive and less profitable under forecast High Fleet conditions. Therefore regional carriers would have less flexibility to absorb cost increases before deciding to cancel flights.

Table 4.5-1
Estimated Annual Peak Period Flight Cancellations and Impact on Fleet Assumptions

Forecast Scenario	Forecast Logan Operations (Alternatives 1A and 4)	Estimated Annual Cancellations	Forecast Logan Operations (Alternatives 1, 2 and 3)
29M Low	510,000	4,000	506,000
37.5M High	608,000	56,000	552,000

4.5.2 Potential for Changes in Regional Carrier Fleet Mix in Response to Peak Period Pricing

In responses to the EOECA Certificate, this section describes the potential effect of Peak Period Pricing on changes in aircraft fleet mix.

By applying a fixed surcharge to flights operating in designated peak periods, the tested pricing structure provides a competitive advantage to carriers operating larger aircraft and carrying a greater number of onboard passengers. This is because the fixed peak period fee can be spread over a greater number of passengers, producing a lesser impact per

passenger. The fixed surcharge would therefore accentuate the unit cost advantage already exhibited by larger capacity regional carrier aircraft over smaller equipment.

In the analytic framework used to evaluate the impacts of Peak Period Pricing on market services and Logan delays, carriers were assumed to shift flights scheduled near the beginning and end of the defined peak period to adjacent, off-peak hours in order to avoid the peak period surcharges. On nonstop routes where a regional carrier was projected to incur a significant reduction in profitability due to the cost impacts of the program, cancellation of some peak period flights was projected. The percent of peak period flights cancelled in specific carrier markets was directly related to the degree of profit reduction. Carriers operating smaller regional aircraft in the 9- and 19-seat class were projected to account for the majority of flight cancellations.

In markets where Peak Period Pricing leads to a reduction in flight frequency during peak hours, carriers may be able to consolidate passenger traffic on remaining peak period flights. In some cases, a carrier that had the option within its fleet might substitute a larger capacity aircraft on remaining flights to better accommodate the passenger traffic previously carried on cancelled flights.

Over a near-term horizon, the opportunities for regional carriers to substitute larger aircraft on Logan routes would be limited by their aircraft fleet composition. Many of the regional airlines operating at Boston maintain an aircraft fleet consisting of a single type of aircraft. For example, Cape Air operates only 9-seat Cessna aircraft, while Commutair and Colgan operate 19-seat Beech 1900 aircraft exclusively. Similarly, Allegheny operates only 37-seat Dash 8-100 aircraft.⁵ Business Express, recently acquired by American Airlines, has already phased out its 19-seat aircraft, while American Eagle operates only aircraft with greater than 30 seats.

Several Logan regional carriers maintain fleets consisting of multiple aircraft types in varying size categories. It is reasonable to expect that Peak Period Pricing would lead to aircraft substitutions on specific routes served by these carriers in circumstances where the use of larger aircraft would improve market profitability. These types of fleet mix changes were anticipated in the analysis developed in the Airside Project Draft EIS/EIR and are consistent with the results. Fleet mix changes were not explicitly projected because of the uncertainty of these changes and because the delay modeling analysis is more sensitive to changes in flight frequency as compared to changes in aircraft size within the regional non-jet fleet.

The EOECA Certificate and several comments also raised the prospect of regional carriers shifting flights from Logan to alternate airports in the region. Two classes of passengers currently fly on regional carrier flights to and from Logan:

- Local passengers for whom Boston or the surrounding region is the origin or destination of their trip
- Passengers connecting at Boston to or from other domestic or international destinations.



5 Source: 1999 Regional Airline Association Annual Report.

For local passengers, particularly those with ground origins or destinations in the immediate Boston area, the use of other airports in the region may not represent a viable alternative. Because Boston is the largest city in the region, it generates the highest concentration of passenger demand to and from regional carrier markets. The use of alternate airports such as Manchester, Providence or Worcester would be accompanied by a significant reduction in local passenger traffic.

For passengers making connections at Boston to and from the national air transportation system, the regional airports would also represent a less desirable alternative. Even with the recent expansion of services at regional airports such as Providence and Manchester, the frequency and diversity of potential connecting services at these airports fall well below the services available at Boston. Shifting flights now serving Boston to one of the alternate regional airports would again be expected to produce a reduction in connecting passenger demand.

For these reasons, the analysis presented in the Airside Project Draft EIS/EIR does not assume that regional carriers would respond to Peak Period Pricing by shifting Boston flights to alternate airports. While some limited flight shifts to alternate airports could occur, it is not expected that a substantial portion of Logan's existing regional carrier services could be economically supported at alternate regional airports.

4.5.3 Analysis of Peak Period Pricing Exemption Program

The effects of Peak Period Pricing on access to Logan were examined in the regional carrier and small community case studies presented in Airside Project Draft EIS/EIR. This issue was the subject of numerous comments voiced at public hearings and received in formal comment letters addressing the Airside Project Draft EIS/EIR. Comments were received from residents and public officials representing potentially affected communities, and from other interested parties. The EOECA Certificate specifically requested that Massport explore the issue of a tightly crafted exemption program designed to mitigate potential service disruption at small communities.

In response to these concerns, this section expands the Peak Period Pricing analysis presented in the Airside Project Draft EIS/EIR to reflect the inclusion of an exemption program. The purpose of the expanded analysis is to determine whether a limited exemption program could successfully mitigate some of the negative service related impacts of Peak Period Pricing without unduly diluting the effectiveness of Peak Period Pricing as a vehicle to reduce airline overscheduling and its associated delays.

Parameters and methodology used in evaluating the illustrative exemption program are described below:

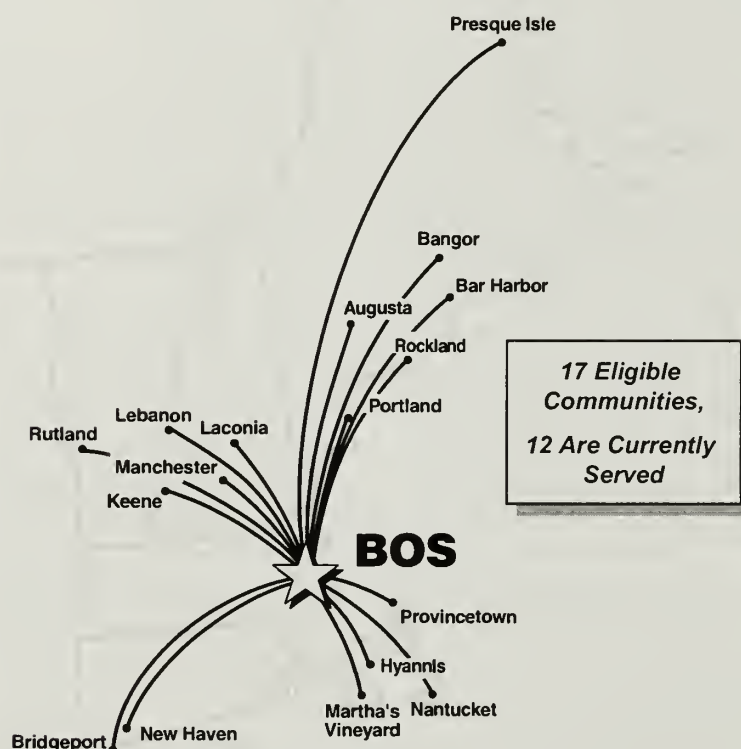
- Communities were considered as eligible for Peak Period Pricing exemptions if they qualified for the Federal Essential Air Service (EAS) program, and if Boston was designated as a qualifying hub destination. Based on this criterion, 16 New England communities (Figure 4.5-1) were included in the illustrative exemption program. Provincetown, MA was added to the exemption program, despite its lack of EAS

eligibility, because previous analysis indicated that this market relied exclusively on Boston for access to the national airport system, and consequently would potentially bear a unique, disproportionate burden resulting from Peak Period Pricing at Logan. Burlington, VT was not included because it has EAS to New York.

- A total of two daily roundtrips (or four operations) during the peak period were exempted from peak period surcharges at each of the exemption markets. This is consistent with the Federal EAS program that guarantees small communities a minimum of two daily roundtrips to a designated hub airport and will provide subsidy when necessary to maintain this level of essential air service. In markets served by multiple carriers, exemptions were allocated between carriers based on the level of peak period flights each carrier provided to Boston.
- Reflecting the reduction in peak period surcharges, the weight-based landing fee was adjusted to retain an approximately constant level of total airfield revenue, consistent with current federal guidelines.
- Cost impacts of the modified Peak Period Pricing program were evaluated by carrier and nonstop market using the schedule patterns and modeling framework previously applied for three future fleet scenarios: the 29M Low Fleet and the 37.5M Low and High Fleets. The 29M Low Fleet approximates current operating conditions at Logan, while the 37.5M Low and High Fleets bound the range of likely future activity levels at the airport.
- Flight shifts and cancellations were projected under each scenario using the methodology and assumptions as described previously in this chapter.
- The daily demand profiles were adjusted to reflect the projected shifts and cancellations of peak period flights. The adjusted profiles were then evaluated using the DELAYSIM model to determine the delay reduction impacts of a Peak Period Pricing program as modified to reflect an illustrative small community exemption program.

In addition to the illustrative exemption program elements described above, consideration will also be given to operational factors, such as the use of the 2,557 foot Runway 15L/33R, that may justify exemptions without jeopardizing the delay reduction benefits of Peak Period Pricing. If appropriate, these operational factors would also be incorporated as part of any Peak Period Pricing exemption program that may be implemented in the future.

Figure 4.5-1
Communities Eligible for Exemptions



4.5.3.1 Results of Exemption Analysis

The exemption from peak period surcharges of two daily roundtrips from eligible communities reduces the initial cost impacts of the program on the regional carriers that serve these markets. This lower cost impact translates to lower required fare increases and, ultimately, tempers the profit margin reduction incurred by carriers serving these routes. As a result, the predicted level of flight cancellations with an exemption program is correspondingly less than the projections previously developed for Peak Period Pricing without exemptions.

Table 4.5-2 shows the comparative percent of flights cancelled, with and without the exemption program, from eligible communities. As illustrated in the table, the cancellation percentages are universally lower with the illustrative exemption program. Under the 29M Low Fleet scenario, only 1.3 percent of summer season flights from exemption eligible communities are projected to be cancelled. This compares to a 4.4 percent cancellation rate projected at these communities prior to exemptions. Under the 37.5M Low Fleet, the cancellation rate falls from an original 5.8 percent down to 1.7 percent with exemptions. Under the 37.5M High Fleet scenario, the projected cancellation rate falls to 15.8 percent with exemptions from 22.6 percent in the original analysis.

Table 4.5-2
Comparison of Projected Service Impacts With and Without Peak Period Exemptions

Airport	Projected Flight Cancellations as Percent of Total Daily Operations					
	Without Exemptions			With Exemptions		
	29M Low	37.5M Low	37.5M High	29M Low	37.5M Low	37.5M High
Martha's Vineyard	14.4%	17.6%	49.9%	5.0%	6.5%	44.6%
Provincetown	21.7%	28.2%	71.7%	0.0%	4.0%	37.6%
Hyannis	2.6%	7.9%	23.4%	0.3%	2.3%	17.3%
Nantucket	6.6%	7.0%	16.0%	3.9%	2.9%	14.5%
Keene	-	-	61.3%	-	-	13.1%
Rockland	0.0%	0.0%	43.4%	0.0%	0.0%	13.1%
Lebanon	0.0%	0.0%	17.4%	0.0%	0.0%	11.9%
Portland	0.0%	0.0%	12.1%	0.0%	0.0%	11.2%
Manchester	0.0%	0.0%	11.3%	0.0%	0.0%	9.9%
Bangor	0.0%	0.0%	11.0%	0.0%	0.0%	8.9%
Bar Harbor	0.0%	3.9%	48.4%	0.0%	0.0%	7.4%
Presque Isle	0.0%	0.0%	15.2%	0.0%	0.0%	4.2%
Augusta	4.9%	4.9%	27.3%	0.0%	0.0%	3.8%
Bridgeport	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Total	4.4%	5.8%	22.6%	1.3%	1.7%	15.8%

Note: "-" indicates the EAS airport had no service to Boston in the corresponding scenario.

The 37.5M High Fleet scenario exhibits the smallest decline in projected service impacts due to the illustrative exemption program. This is because the designated peak period under this scenario extends from 7:00 AM to 8:59 PM (i.e., a span of 14 hours). As a result, the two daily roundtrips that were exempted from peak period surcharges represent a proportionately smaller benefit than realized under the alternative Low Fleet scenarios, with their shorter peak periods (5 to 6 hours). Because a significant proportion of peak period flights under the 37.5M High Fleet scenario would continue to be assessed surcharges, the cost mitigation effects of the exemption program are less pronounced and produce a smaller impact on projected flight cancellations.

4.5.3.2 Delay Reduction Impacts

By reducing the number of projected flight cancellations at eligible communities, the exemption program allows more flights to operate during peak periods and lowers the projected delay reduction benefits of Peak Period Pricing (see Table 4.5-3).

Under the 29M Low Fleet scenario, inclusion of the small community exemption program reduces the projected delay reduction benefits of Peak Period Pricing (and Reduced Minimums) by approximately 2,700 hours, with Alternative 2 producing a 6.2 percent

reduction in annual runway-related delays (vs. Alternative 4) as compared to an 8.1 percent reduction without exemptions.

In the 37.5M Low Fleet, the exemption program reduces the delay reduction impact of Peak Period Pricing by 8,100 annual hours. With exemptions, Alternative 2 (which include Peak Period Pricing and Reduced Minimums) reduce annual runway delays by 7.7 percent compared to an 11.1 percent reduction prior to exemptions.

Table 4.5-3
Exemption Program: Delay Reduction Impacts

Alternative	Annual Hours of Runway Delay		
	29M Low	37.5M Low	37.5M High
Alternative 4 – No Action	136,400	233,900	332,700
Alternative 2 – Administrative Actions Only – No Exemptions	125,300	207,900	194,000
Alternative 2 – Administrative Actions Only – With Exemptions	128,000	216,000	208,900
Delay Reduction			
Alternative 4 vs. Alternative 2 – No Exemptions	11,100	26,000	138,700
Alternative 4 vs. Alternative 2 – With Exemptions	8,400	17,900	123,800

Under the 37.5M High Fleet conditions, the exemption program lowers forecast delay savings by approximately 15,000 annual hours. Under this scenario, Alternatives 2 and 3 would produce an estimated 37.2 percent reduction in delay with the exemption program, as compared to a 41.7 percent reduction in runway delays prior to exemptions.

4.5.3.3 Findings of Exemption Program Analysis

The inclusion of a small community exemption program reflects the trade-off between the potential delay reduction benefits of Peak Period Pricing and recognition of the importance of preserving access to Logan from small and medium-sized New England communities. The illustrative exemption program described above was patterned after the Federal Essential Air Service (EAS) Program. Eligible communities were those markets with EAS determinations that designated Boston as a qualifying hub destination. The number of exemptions was established at two daily roundtrips, also consistent with the EAS standard.

By granting a limited number of exemptions to eligible cities, the projected service disruption caused by Peak Period Pricing would be reduced. In limiting the number of exemptions to two daily roundtrips during peak periods, the effectiveness of Peak Period Pricing in reducing delays is generally maintained, particularly under the 37.5M High Fleet scenario where Peak Period Pricing was recommended as an appropriate delay reduction strategy.

4.5.4 Peak Period Monitoring System

Peak period pricing was evaluated as a demand management program designed to limit airline overscheduling at Logan. Overscheduling was a problem in 1993 when airline flight schedules during peak periods exceeded Logan's available capacity. Since 1993, the hourly flight profile at Logan has flattened and current peak period demand can be accommodated with minimal delay during normal operating conditions. Because airline overscheduling is not a significant source of current delays at Logan, Massport did not recommend Peak Period Pricing for immediate implementation in the Preferred Alternative.

However, the analysis in the Airside Project Draft EIS/EIR indicates that under some future scenarios, overscheduling could re-emerge as a significant source of delays, and Peak Period Pricing could produce substantial delay reduction benefits. Based on this finding, Massport stated in the Airside Project Draft EIS/EIR that it would reserve the option to implement Peak Period Pricing, should this be warranted by future flight activity patterns at Logan.

The EOECA Certificate requires that Massport define the conditions that would lead to the implementation of a Peak Period Pricing program. In response, Massport will establish a monitoring system to provide advance warning of when overscheduling is likely to become a significant contributor to delays at Logan. If so, the system would identify the portion of the day where an overscheduling condition would likely occur. This information would then be used as a basis for initiating a discussion with the carriers on how to achieve timely corrective action. If the necessary corrective action is not agreed to then appropriate regulatory action would be taken to reduce or eliminate overscheduling as a source of airfield delays at Logan.

While the detailed structure of the proposed monitoring system has not been finalized, key components of an illustrative monitoring system are described below:

- Projections of Logan flight activity will be developed on a semi-annual basis. These projections will be prepared 4 to 6 months in advance and will represent estimates of flight levels by hour for the upcoming season. Projections will be based on the most recent activity levels at Logan, historic seasonality patterns, and on advance flight schedules submitted by carriers to the OAG, expanded to reflect non-scheduled activity including charter and general aviation. Advance carrier flight schedules have been a reliable indicator of future activity at Logan, as illustrated in Table 4.5-4.
- Logan's average capacity under VFR weather conditions will be evaluated as required to account for fleet mix changes and advances in air traffic control technology as required. VFR conditions are available approximately 80 percent of the year.
- Delays due to overscheduling will be quantified through an analysis that simulates the projected flight schedule against Logan's average VFR capacity. Delays will be estimated by hour to permit designation of a specific peak period when overscheduling conditions are causing significant delays.

- A phased Peak Period Pricing curative process would be initiated when projected delays due to airline overscheduling reach or exceed an average level of 15 minutes per flight over a period of three or more consecutive hours. The 15-minute criterion is based on the FAA threshold for identifying significant delay.

Table 4.5-4
Comparison of Advanced and Actual Flight Schedules for Logan

Year	Daily Nonstop Logan Departures for August		Percent Difference
	Advanced	Actual	
1998	707	724	2.4%
1999	691	689	-0.2%

Note: Advanced schedules based on April OAG Schedule Tape.

Source: Official Airline Guide, Schedule Tapes.

Phase 1: Voluntary Schedule Adjustments

When the 15-minute delay threshold is projected to be exceeded, Massport will first meet individually with airlines that exhibit significant levels of flight activity during the identified peak period. These carriers would be informed that Peak Period Pricing will be invoked unless flight schedules are reduced below threshold levels. If voluntary schedule adjustments occur, the Peak Period Pricing regulatory requirements would be deferred.

Phase 2: Regulatory Action

If voluntary schedule adjustments do not eliminate the overscheduling situation, Massport will take the necessary steps to implement Peak Period Pricing at Logan. Massport will continue to monitor flight schedules and make adjustments to the peak period as warranted by future schedule changes. Massport will also make other adjustments to the monitoring system and the Peak Period Pricing program if necessary to effectively address any overscheduling situation that may arise.

4.6 Aircraft Delay and Runway Use Results

The Logan airfield modeling methodology, described in Chapter 4 of the Airside Project Draft EIS/EIR, was used to estimate aircraft delays and runway utilization for the 1993 historic analysis and for each of the future passenger demand and aircraft activity levels. To provide perspective on current conditions at Logan, additional analysis of 1998 conditions was also performed for this Supplemental DEIS/FEIR. At the request of the SDEIS Panel, a new 37.5 million passenger High Regional Jet Fleet (37.5M High RJ Fleet) scenario was also examined; the results of the High RJ Fleet analyses are presented in Section 4.7.

4.6.1 Analysis of Historic (1993) and Current (1998) Delays

The year 1993 represents a peak year for small aircraft operations at Logan Airport. Flight operations in 1993 also exhibited a relatively high degree of hourly peaking compared to the current, flatter operations profile at Logan. The year 1993 was originally chosen as an analysis year since it represented the most recent complete year of available data at the beginning of the Logan Airside Improvements Feasibility Study. Though considerable time has passed since 1993, the analysis year illustrates operating and environmental conditions at Logan during a period of airline overscheduling and high delays.

To supplement the 1993 historic analysis, 1998 conditions have been studied in the Supplemental Draft EIS/Final EIR to provide a more recent point of reference. Since 1998 has less hourly peaking, delays are lower than those in 1993, even though total demand was nearly the same. While these years provide context for historic and current conditions at Logan, the appropriate data for assessing the benefits of the proposed Airside Project improvement concept in future years is a comparison of the action Alternatives (Alternatives 1, 1A, 2 and 3) to Alternative 4, the No Action Alternative. The 1993 and 1998 analyses are useful for model calibration and for providing a frame of reference.

The 1993 historic analysis estimated 159,000 annual hours of aircraft delay at Logan, with 135,000 hours of delay related to runway congestion and 24,000 hours resulting from taxiway congestion. The delay analysis for 1998 indicates that Logan incurred 120,000 hours of runway-related delays in that year, comparable but slightly below the 1993 level of 135,000 hours. While detailed simulation of taxiway movements were not conducted for 1998, an estimated 22,000 annual hours of taxiway delays occurred in 1998 based on interpolation from other modeled scenarios. Incorporating both runway and taxiway delays for 1998, Logan experienced total aircraft delays of approximately 142,000 hours during the year.

Analysis of 1998 Delays with the Preferred Alternative

In addition to modeling actual Logan operating conditions and delays, the analysis also re-modeled 1998 activity assuming that the airfield improvements contained in the Preferred Alternative were in place. This analysis quantifies the delay reduction benefits that would have been realized at Logan in 1998 if the Preferred Alternative had been implemented.

Logan operations during 1998 were analyzed using 1998 runway utilization from the *1998 Annual Update* and actual 1998 weather observations. The version of DELAYSIM used for the 1998 delay analysis included an added feature for tabulating delays by wind direction. In order to demonstrate the benefits of Runway 14/32 under northwest wind conditions, the analysis of actual 1998 conditions was compared to projected 1998 results assuming that the Preferred Alternative improvements were in place.

Similar to the results for future year operating conditions, if Runway 14/32 had been available in 1998, Logan would have experienced a 32 percent reduction in runway delays, or 82,000 hours versus 120,000 hours without the Preferred Alternative improvements (Table 4.6-3). While this improvement is significant, the analysis of VFR delays is even more compelling and demonstrates the impact of unidirectional Runway 14/32 on VFR delays, particularly under northwest wind conditions. Figure 4.6-1 shows that the Preferred Alternative would have reduced 1998 VFR delays by 69 percent, from 51,000 annual delay hours to only 16,000 hours.

Figure 4.6-1 also categorizes 1998 VFR delays by wind direction. As shown in the figure, delays from northwest winds made up 70 percent of VFR delays in 1998. Since winds from the northwest accounted for only 37 percent of the 1998 VFR weather conditions, northwest winds generated a disproportionate percentage of the VFR delays. The disproportionate share of VFR delays that occur during northwest winds demonstrates the inefficiency caused by Logan's lack of a third runway in the northwest-southeast orientation. A comparison of the 1998 No Action and Preferred Alternative results indicates that Runway 14/32 would have had a dramatic effect on VFR northwest wind delays in 1998, reducing them by nearly 90 percent. This case study of VFR delays under northwest wind conditions demonstrates the effectiveness of Runway 14/32 under current operating conditions at Logan.

4.6.2 Total Delays

Massport selected Alternative 1A as its Preferred Alternative (all actions except Peak Period Pricing) because airline overscheduling is not currently a problem at Logan. Further, the delay reduction benefits associated with Peak Period Pricing come at a cost to passengers, communities and the regional carriers. If airline overscheduling emerges as a significant contributor to Logan delays, the monitoring program provides for a clear plan of action to alleviate that condition (see Section 4.5.4).

The following discussion analyzes the delay reduction savings associated with the Preferred Alternative under two fleets that reflect a broad range of likely operating conditions at Logan over the near and long term—the 29M Low Fleet and the 37.5M High Fleet.

Figure 4.6-1
Annual VFR Delay Hours by Wind Direction

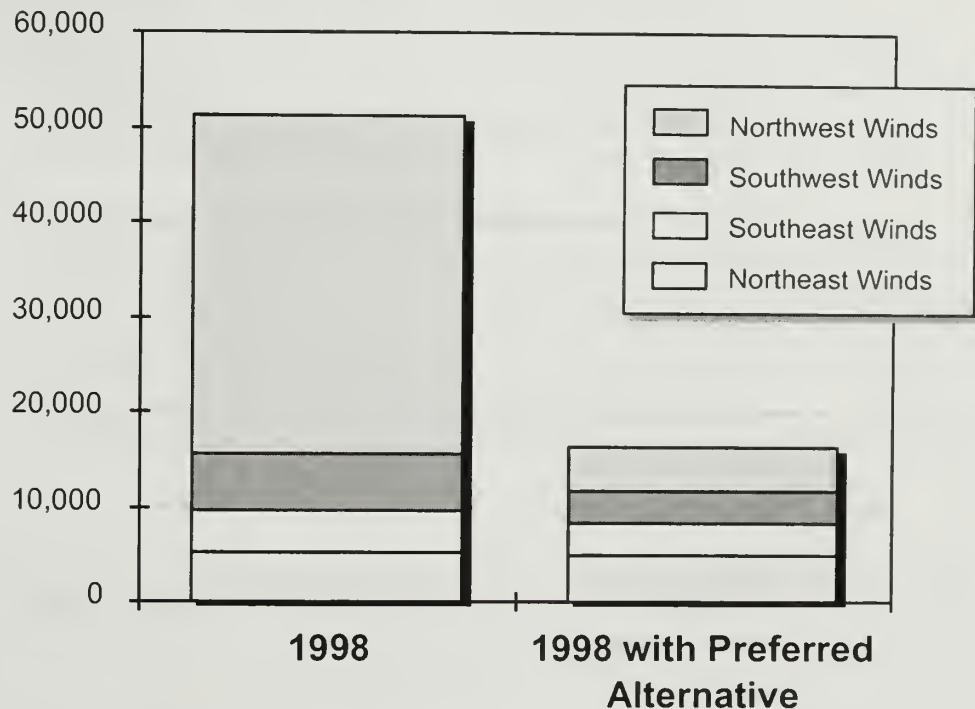


Table 4.6-1 compares the results of the operating delay analysis of the Preferred Alternative versus the No Action Alternative under the 29M Low Fleet and the 37.5M High Fleet scenarios. The airfield operations analysis indicates that Logan will incur extremely high levels of delay if no actions are taken to improve airport operating efficiency. For the No Action Alternative (Alternative 4) under the 29M Low Fleet, which reflects the lowest growth in aircraft operations, Logan passengers and airlines are forecast to experience 157,500 annual hours of delay. Even under this most conservative growth scenario, the extent of Logan's delay problem is highlighted by the FAA's threshold of 20,000 annual hours of delay which is used to identify severely congested (i.e., delay prone) airports. If aircraft operations at Logan reach the level projected under the 37.5M High Fleet, delays could exceed 360,000 hours per year, more than double the 159,000 hours of modeled delay in the 1993 historic analysis.

Under Low Fleet conditions that are most similar to current conditions at Logan (29M Low), the Preferred Alternative produces a delay reduction contribution of over 43,000 hours. This represents a savings in delay of approximately 27 percent under likely near term conditions as shown in Table 4.6-2.

Table 4.6-1
Total Hours of Runway and Taxiway Delay by Alternative and Fleet Scenario

Alternative	Runway and Taxiway Total Annual Delay Hours	
	29M Low	37.5M High
Total Delay		
Preferred Alternative - All except Peak Period Pricing	114,450	249,600
Alternative 4 - No Action	157,500	363,400
Delay Reduction		
Alternative 1 vs. Alternative 4	46,100	194,800
Preferred Alternative vs. Alternative 4	43,050	113,800

Table 4.6-2
Percent Reduction in Total Annual Hours of Delay by Fleet Scenario for the Preferred Alternative (Including Runway and Taxiway Delay)

Improvement Concept	Percent Delay Reduction vs. No Action	
	29M Low	37.5M High
Preferred Alternative - All except Peak Period Pricing	-27.3%	-31.3%
Annual Hours of Delay		
Alternative 4 – No Action	157,500	363,400
Preferred Alternative	100,000	200,000

The contribution of the Preferred Alternative grows rapidly in future conditions. The 37.5 M High Fleet represents an appropriate upper bound for future conditions at Logan. Under this future High Fleet scenario, the Preferred Alternative produces 114,000 hours of delay reduction—a savings that is comparable to the current level of runway related delay at Logan. The Preferred Alternative would provide delay savings of 31.3 percent compared to the No Action Alternative.

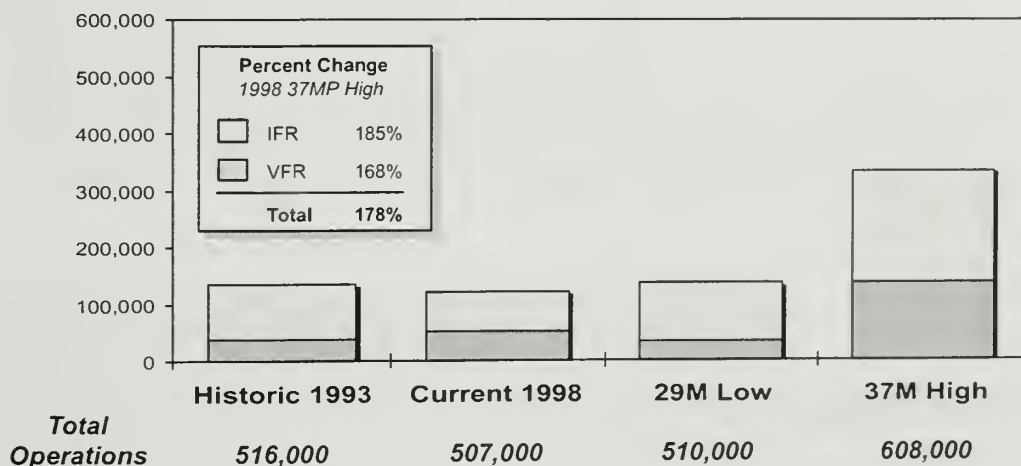
In the 37.5M High Fleet scenario, flights at Logan would experience an average delay of 36 minutes per flight (runway plus taxiway delay). Based on the estimated \$2,500 per hour cost of aircraft delay, including both aircraft operating expenses and the value of time for airline passengers, the potential level of delays in the 37.5M High scenario could cost airlines and passengers \$925 million if no improvements are made.

4.6.3 Runway Related Delays

Total Logan operating delays can be segmented into two principal components—runway delays and taxiway delays. Separate analysis of these segments provides a clearer understanding of the benefits associated with the Preferred Alternative. Runway-related delays account for the majority of aircraft delays at Logan. The Preferred Alternative will significantly reduce runway-related delays, but because of limited runway capacity under severe weather conditions, Logan will continue to experience some runway-related delay under all forecast scenarios.

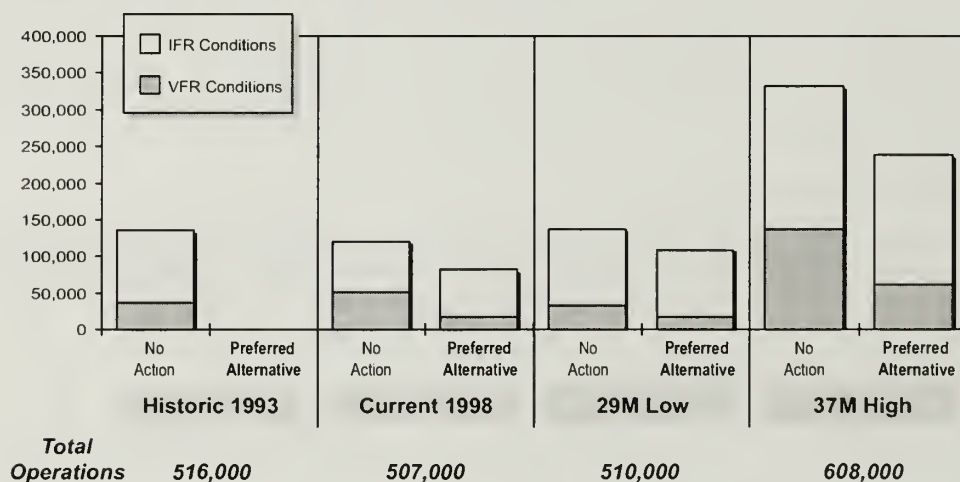
Figure 4.6-2 shows the forecast distribution of runway delays between VFR (Visual Flight Rules) and IFR (Instrument Flight Rules) weather conditions at Logan. IFR conditions reflect poor weather that ranges from low cloud cover to heavy fog and blizzards. While IFR conditions prevail less than 15 percent of the time at Logan (using the ten-year weather data), a disproportionately high share of historic airport delays have occurred during these conditions. In 1993, for example, over 70 percent of modeled delays occurred in IFR conditions. In 1998, (with actual 1998 weather), IFR conditions occurred 13 percent of the time and made up 57 percent of the delays.

Figure 4.6-2
Forecast Annual Hours of Delay by Weather Condition – No Action Alternative



As shown in Figure 4.6-3, future growth in aircraft operations will produce large increases in VFR delays under the No Action Alternative. Under the 37.5M High Fleet scenario, VFR delays will increase by 168 percent over 1998 levels if no actions are taken to address the delay problem at Logan. Conversely, implementation of the Preferred Alternative (Alternative 1A) will substantially reduce the growth in delays occurring in VFR conditions. Under the 37.5M High Fleet scenario, if the Preferred Alternative is implemented VFR delays would be reduced by over 50 percent compared to the No Action Alternative.

Figure 4.6-3
Forecast Annual Hours of Delay by Weather Condition –
Preferred Alternative vs. No Action Alternative



As Table 4.6-3 shows, if no action is taken, runway delay could grow from 120,000 hours in 1998, to 333,000 hours under 37.5M High Fleet conditions. This represents an increase of 175 percent. The Preferred Alternative would reduce runway-related delays by 38,000 hours under current conditions and 94,000 hours in the 37.5M High Fleet scenario.

Table 4.6-3
Hours of Delay by Alternative and Fleet Scenario

Alternative	Runway Related Delay		
	1998	29M Low	37.5M High
Preferred Alternative - All except Peak Period Pricing	82,000	108,000	239,000
Alternative 4 - No Action	120,000	136,000	333,000
Delay Reduction			
Preferred Alternative vs. Alternative 4	38,000	28,000	94,000

4.6.4 Taxiway Related Delays

The second component of airfield delay at Logan is taxiway delay. While the level of taxiway delays at Logan is not as high as delays associated with runway constraints, the airfield operations analysis indicates that taxiway improvements will provide substantial delay reduction. Table 4.6-4 shows the level of taxiway-related delays associated with the Preferred Alternative in comparison to the No Action Alternative.

The taxiway delay reduction associated with the Preferred Alternative ranges from 15,000 annual hours under the 29M Low scenario to 19,800 hours under the 37.5M High Fleet scenario. At approximately \$2,500 per hour of delay, the potential reduction in taxiway-related delays represents annual cost savings of between \$37 and \$49 million.

Table 4.6-4
Hours of Taxiway Delay by Alternative and Fleet Scenario

Alternative	Taxiway Related Delay	
	29M Low	37.5M High
Preferred Alternative – All except Peak Period Pricing	6,450	10,600
Alternative 4 – No Action	21,500	30,400
Delay Reduction		
Preferred Alternative vs. Alternative 4	15,050	19,800

Taxiway construction improvements make the largest contribution to reduction in taxiway delays, but the addition of unidirectional Runway 14/32 also contributes to taxiway delay savings. The availability of Runway 14/32 permits a shift in runway usage patterns that allow the use of more efficient taxiway configurations. Under the 37.5M High scenario, Alternative 2 which includes taxiway construction (but does not include Runway 14/32) reduced delay by 4,900 hours per year compared to Alternative 3 which does not include taxiway improvements. The construction of Runway 14/32, included in the Preferred Alternative, reduces taxiway-related delay by a further 4,700 hours per year in addition to reducing runway-related delays. Appendix K of the Airside Project Draft EIS/EIR includes the "Taxiway Delays Case Study" which examined taxiway delays during periods of peak terminal utilization.

4.6.5 Runway Use

The delay reduction benefits associated with Alternative 1A were critical to its selection as the Preferred Alternative. A second important factor was the effect that Runway 14/32 would have on runway use patterns which in turn directly impacts both the level and distribution of aircraft related noise. The addition of Runway 14/32 and the resultant flexibility that controllers would have to shift runway use patterns provides the communities to the north and south of Logan substantial relief from noise, while at the same time moving a substantial portion of Logan's operations over water. By reducing the reliance on north/south runways, Runway 14/32 allows greater performance relative to the PRAS annual runway use goals—in fact, the predicted PRAS conformance nearly doubles with Runway 14/32. Without unidirectional Runway 14/32, the communities to the north and south of Logan will bear an increasingly disproportionate high impact from flight activity at Logan.

This section describes the differences in runway use patterns for the Preferred Alternative and the No Action Alternative. The analysis will describe effective jet utilization⁶, which weights nighttime operations ten times more heavily than daytime operations. This weighting reflects how noise is perceived by the public and thus is a key input for estimating in-flight noise impacts.

4.6.5.1 Annual PRAS Goals

Without airfield improvements, air traffic controllers will have fewer runway options as activity at Logan increases, limiting their ability to follow preferred runway use procedures. As illustrated in Table 4.6-5, without Runway 14/32 the percentage of effective jet operations impacting populated areas to the northeast and west of Logan is projected to increase from 69 percent in 1998 up to 82 percent in the 37.5M High Fleet scenario. By providing an additional three-runway configuration with a northwest orientation, unidirectional Runway 14/32 would permit a more balanced distribution of operations by direction. In the 37.5M High Fleet scenario, the effective jet utilization of runways affecting communities to the north and south would decline from 82 percent to 57 percent with the

▼
6 Effective jet utilization excludes non-jet operations and weights nighttime jet operations, operated from 10:00 PM to 7:00 AM, by a factor of 10.

availability of unidirectional Runway 14/32. In addition, effective jet activity to the southeast or over the water would increase from 13 to 26 percent with unidirectional Runway 14/32.

Table 4.6-5
Distribution of Effective Jet Aircraft Operations by Operating Direction

Direction	1998	37.5M High Fleet	
		Alternative 4 No Action	Alternative 1A Preferred Alternative
North and South	69%	82%	57%
East (Overwater)	21%	13%	26%
West	10%	5%	17%
Total	100%	100%	100%

A summary of effective jet aircraft runway use for the 1993, 29M Low and 37.5M High Fleets is presented in Table 4.6-6 for arrivals and Table 4.6-7 for departures. The information for the future scenarios is also presented graphically in Figures 4.6-4 and 4.6-5 (Appendix H of the Airside Project Draft EIS/EIR included effective jet runway use for the 29M High, 37.5M Low, and 45M High Fleets. Also see Appendix B of this Supplemental DEIS/FEIR for the 1998 Fleet).

In all future forecast scenarios, the Preferred Alternative increases operations over water and achieves a more balanced distribution of operations over land because it includes Runway 14/32. For example, in the 29M Low scenario, the Preferred Alternative increases equivalent jet arrivals for Runways 15R, 32 and 33L compared to Alternative 4 (No Action). In the same scenario, equivalent jet arrivals on Runway 4R, which occur over land and impact the South Boston and South Shore communities, are reduced significantly. In terms of departures, the Preferred Alternative causes an increase in equivalent jet utilization for Runways 14 and 15R (overwater) and a significant reduction for Runway 9, which impacts the Point Shirley community.

Table 4.6-6
Effective Arrivals by Fleet and Runway End

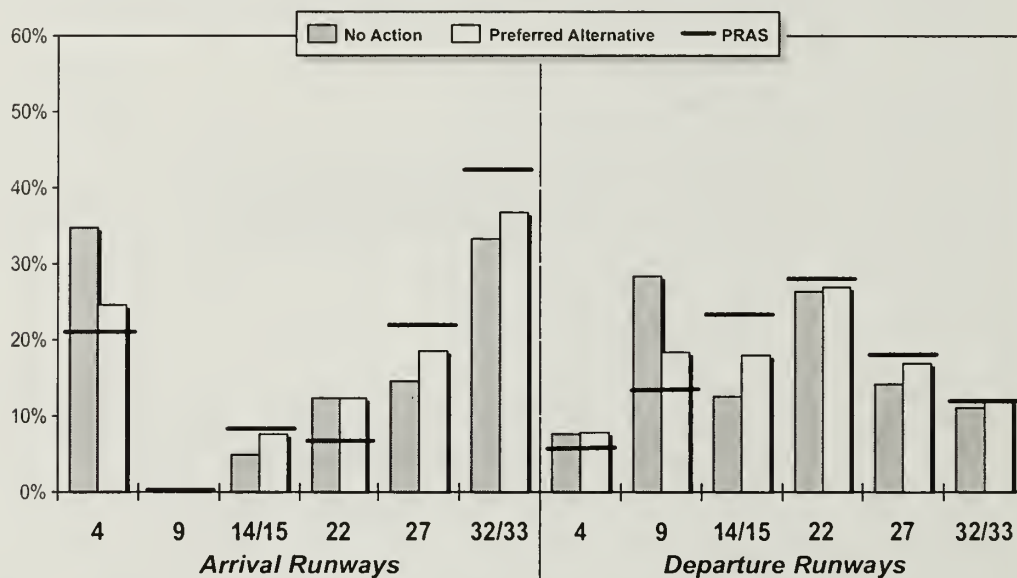
Runway End and Improvement Concept	Percent Effective Arrivals by Fleet		
	1993 Historic	29M Low	37.5M High
Runway 4L/R			
PRAS Goal	21.1	21.1	21.1
Alternative 1 - All Actions	--	24.6	30.0
Preferred Alternative - All Except Peak Period Pricing	--	24.6	29.7
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	34.1	45.4
Alternative 4 - No Action	35.8	34.8	47.3
Runway 15L/R			
PRAS GOAL	8.4	8.4	8.4
Alternative 1 - All Actions	--	7.7	6.0
Preferred Alternative - All Except Peak Period Pricing	--	7.7	4.1
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	4.1	2.1
Alternative 4 - No Action	3.7	4.9	1.2
Runway 22L/R			
PRAS Goal	6.5	6.5	6.5
Alternative 1 - All Actions	--	12.2	12.0
Preferred Alternative - All Except Peak Period Pricing	--	12.3	16.1
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	12.1	13.9
Alternative 4 - No Action	11.7	12.4	21.6
Runway 27			
PRAS Goal	21.7	21.7	21.7
Alternative 1 - All Actions	--	18.6	16.0
Preferred Alternative - All Except Peak Period Pricing	--	18.6	13.1
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	14.6	23.7
Alternative 4 - No Action	16.9	14.6	15.7
Runways 33L and 32			
PRAS Goal	42.3	42.3	42.3
Alternative 1 - All Actions	--	36.8	35.9
Preferred Alternative - All Except Peak Period Pricing	--	36.8	37.0
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	35.0	14.9
Alternative 4 - No Action	31.8	33.2	14.2

Table 4.6-7
Effective Departures By Fleet and Runway End

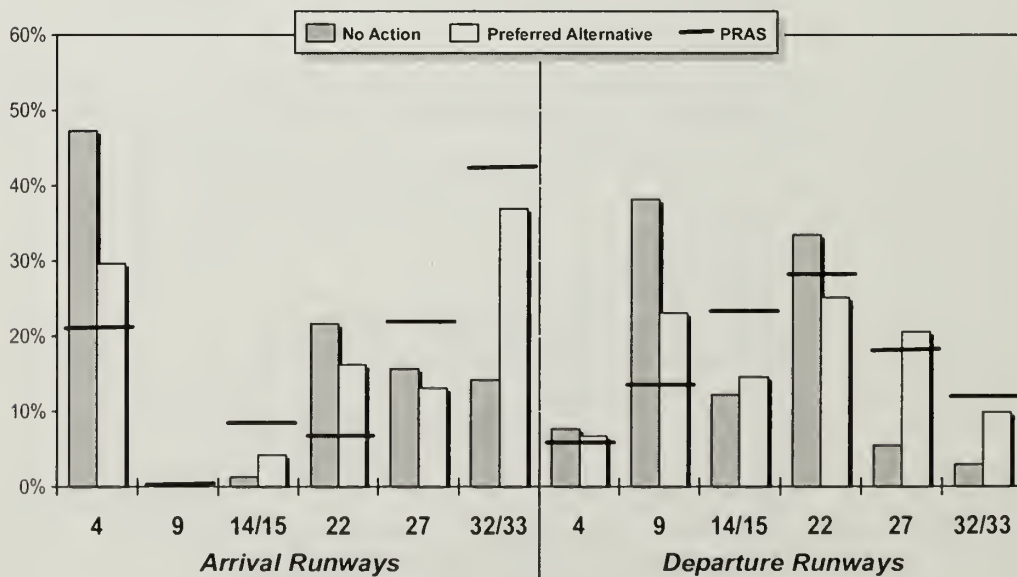
Runway End and Improvement Concept	Percent Effective Departures by Fleet		
	1993 Historic	29M Low	37.5M High
Runway 4L/R			
PRAS Goal	5.6	5.6	5.6
Alternative 1 - All Actions	--	7.6	11.1
Preferred Alternative - All Except Peak Period Pricing	--	7.8	6.7
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	7.0	13.9
Alternative 4 - No Action	10.3	7.7	7.7
Runway 15L/R and 14			
PRAS Goal	23.3	23.3	23.3
Alternative 1 - All Actions	--	18.1	11.6
Preferred Alternative - All Except Peak Period Pricing	--	18.0	14.6
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	13.0	9.5
Alternative 4 - No Action	12.9	12.5	12.2
Runway 22L/R			
PRAS Goal	28.0	28.0	28.0
Alternative 1 - All Actions	--	26.9	24.8
Preferred Alternative - All Except Peak Period Pricing	--	27.0	25.1
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	26.1	37.3
Alternative 4 - No Action	27.5	26.3	33.4
Runway 27			
PRAS Goal	17.9	17.9	17.9
Alternative 1 - All Actions	--	17.0	17.1
Preferred Alternative - All Except Peak Period Pricing	--	16.9	20.5
Alternative 2/3 - All Except Runway 14/32 and No Build	--	15.2	5.4
Alternative 4 - No Action	12.3	14.1	5.5
Runway 33L			
PRAS Goal	11.9	11.9	11.9
Alternative 1 - All Actions	--	12.0	9.8
Preferred Alternative - All Except Peak Period Pricing	--	12.0	9.9
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	11.5	1.7
Alternative 4 - No Action	11.7	11.1	3.0
Runway 9			
PRAS Goal	13.3	13.3	13.3
Alternative 1 - All Actions	--	18.5	25.7
Preferred Alternative - All Except Peak Period Pricing	--	18.4	23.1
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	27.3	32.3
Alternative 4 - No Action	25.2	28.3	38.2

Figure 4.6-4

Runway Utilization and PRAS Goals – 29M Low Fleet Scenario (510,000 Operations)
Percent of Equivalent Operations on Runway

**Figure 4.6-5**

Runway Utilization and PRAS Goals – 37.5M High Fleet Scenario (608,000 Operations)
Percent of Equivalent Operations on Runway



The Preferred Alternative offers a dramatic improvement in overall annual PRAS goal achievement, and by providing reduced approach minimums, also offers greater flexibility and improves PRAS goal achievement under poor weather conditions. The overall degree to which airfield operations approach annual PRAS goals for runway use at Logan can be measured in terms of the PRAS Performance Index (PPI) described previously in this chapter. A value of zero would represent perfect compliance with the PRAS goals, compared to the 1998 *Annual Update* value of 997. An improvement in terms of the PRAS goals is expressed as a decline in the PPI, which means that lower values indicate better conformance (see Table 4.6-8).

For most runway ends, the Preferred Alternative provides closer achievement of the annual PRAS runway use goals. For some runway ends, such as 15R, greater compliance with the PRAS goals leads to an increase in effective jet utilization.

Table 4.6-8
Achievement of Annual PRAS Runway Use Goals

Improvement Concept	PRAS Performance Index		
	1998 Historic	29M Low	37.5M High
Perfect PRAS Compliance	0	0	0
Preferred Alternative - All Except Peak Period Pricing	59	147	480
Alternative 4 - No Action	997	731	2,803

4.6.5.2 Dwell and Persistence

The short-term PRAS goals include dwell (one-day) and persistence (three-day) goals. (See Section 4.3.2.2) The DELAYSIM model measures compliance with dwell and persistence goals in terms of annual hours in excess of the defined targets. It is important to note that increases in dwell or persistence for overwater areas actually represent benefits since this results in a corresponding decrease in the total hours of flying over more populated areas.

The addition of Runway 14/32 and the reduced approach minimums on Runways 15R, 22L, 27 and 33L result in substantial benefits, with significantly fewer hours of dwell over populated areas. Figures 4.6-6 and 4.6-7 illustrate annual hours of dwell exceedence by runway end for the 29M Low and 37.5M High Fleets.

Figure 4.6-6
Annual Hours of Dwell Exceedence by Noise Area – 29M Low Fleet Scenario
(510,000 Operations)

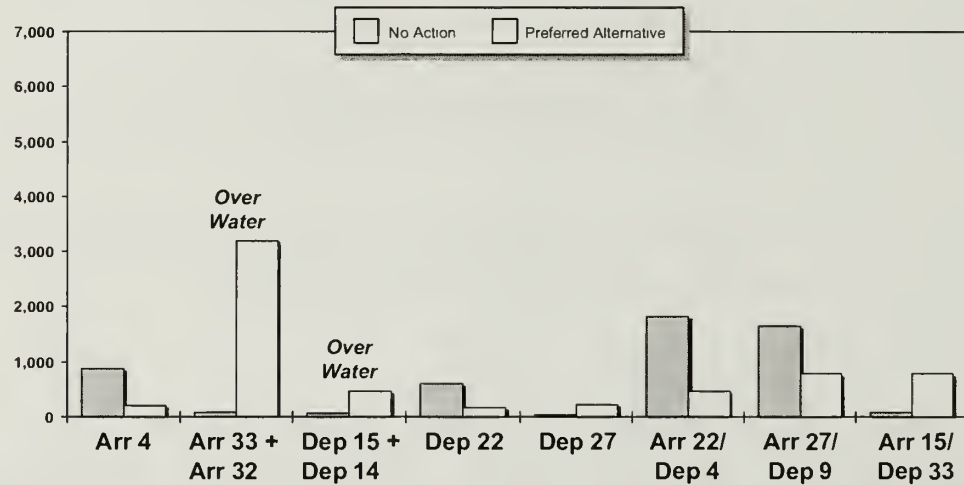
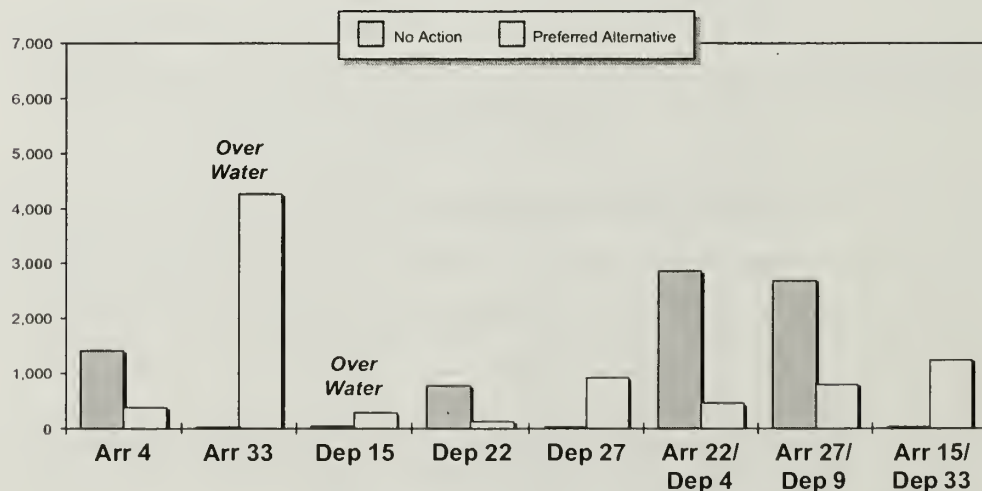
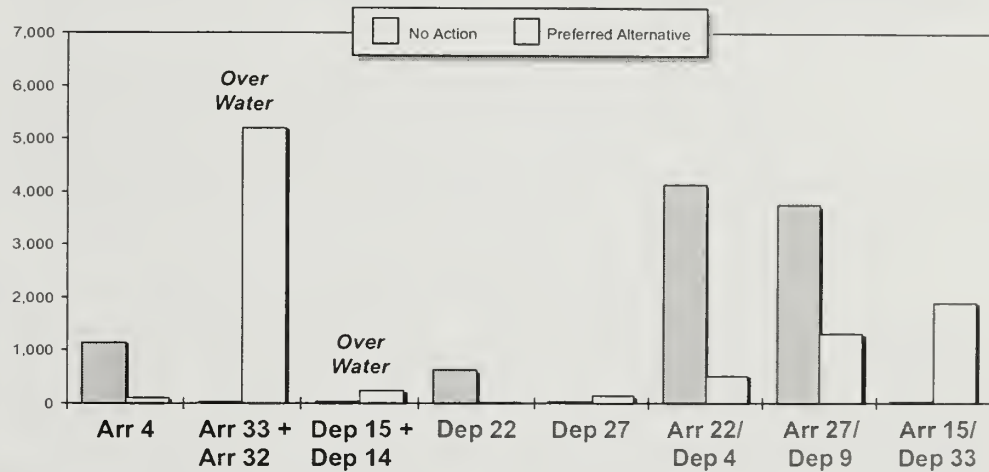
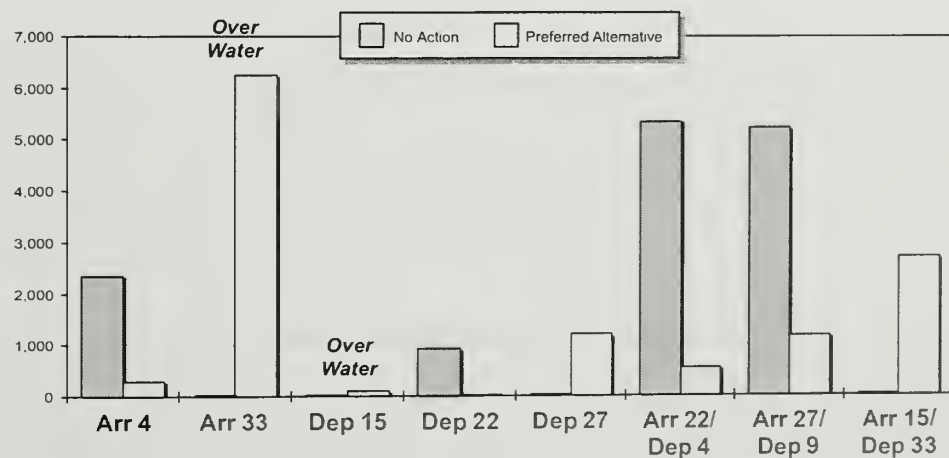


Figure 4.6-7
Annual Hours of Dwell Exceedence by Noise Area – 37.5M High Fleet Scenario
(608,000 Operations)



The hours of persistence exceedence presented in Figure 4.6-8 and Figure 4.6-9 are consistent with those for dwell. As with dwell, the addition of Runway 14/32 results in significant improvements, particularly in the long-term scenario. A significant environmental benefit of Runway 14/32 is that hours of persistence exceedence for overwater areas increase dramatically (e.g., from 74 to 3,186 hours in the 29M Low Fleet for arrivals to Runway 33), while in most cases, persistence over populated areas and therefore perceived noise impacts is greatly reduced. Figures 4.5-8 and 4.6-9 illustrate annual hours of persistence exceedence by runway end for the 29M Low and 37.5M High Fleets.

Figure 4.6-8**Annual Hours of Persistence Exceedence by Noise Area – 29M Low Fleet Scenario
(510,000 Operations)****Figure 4.6-9****Annual Hours of Persistence Exceedence by Noise Area – 37.5M Low Fleet Scenario
(608,000 Operations)**

4.7 Aircraft Delay and Runway Use Results for High Regional Jet Scenario

The Logan airfield modeling methodology, described previously in this chapter and in Chapter 4 of the Airside Project Draft EIS/EIR, was also used to estimate runway delays and runway utilization for the new 37.5M High RJ Fleet described in Section 4.2. This analysis was identical to that discussed previously with the following three exceptions.

The High RJ scenario examined only the runway related delays. The Airside Project Draft EIS/EIR developed taxiway delays for a full range of future fleet scenarios. The taxiway delays comprise a relatively small fraction of the runway delays in every case, and there is no reason to expect that the taxiway delay savings for the High RJ fleet would differ in any significant manner from those of the other fleets (e.g., 15,000 to 20,000 annual hours).

Due to the nature of the High RJ fleet, the delay models were modified to allow the regional jets to be analyzed as separate classes. Thus, for example, the runway assignments and runway utilization statistics can extract the regional jets from the other conventional jets.

The largest change in the High RJ analysis was the use of newer weather data for estimating delays and runway utilization for this scenario. Several comments received on the Airside Project Draft EIS/EIR suggested that the 1981 through 1990 weather database used in the prior studies should be updated with later information. Analysis has shown that there have been no climatic changes since 1981-90 that could substantially alter the conclusions of the earlier studies, the FAA has recently augmented its weather database with the inclusion of wind gust observations that were not previously available. Since controllers and pilots normally consider wind gusts when selecting active runways at the airport, this newer data was adopted for the analysis of the 37.5M High RJ Fleet scenario. Because the enhanced weather data has only been available since 1997, the delay and runway use results for the High RJ Fleet scenario are based on a three-year weather period rather than the ten-year period employed previously. The general impact of the wind gust data is to reduce somewhat the availability of each runway configuration. This is because the wind speed with gusts is the same as or greater than without the gusts, so the cross-wind or tail-wind restriction will occasionally exclude a runway configuration that would otherwise be available. As a consequence of the wind gust data, the analysis of runway use and corresponding delays for the 37.5M High RJ fleet represents an improved estimate of actual operating practice at the airfield.

Since operational experience with regional jets is still relatively limited, there is no unanimity among pilots, controllers, airlines, airport operators and manufacturers as to their practical limitations. To assess the benefits of Runway 14/32 under different assumptions, a sensitivity analysis is presented in Section 4.7.3. The assumption adopted for the nominal analysis follows the suggestions in the *FAA Consultant Report of Regional Jet Utilization of Runway 14/32* in Appendix C: all Dornier model RJs will be able to land on Runway 32; all Embraer model RJs will be able to land on Runway 32 in dry conditions (but not when the runways are wet); and Canadair models will not use Runway 32.

The final refinement in the 37.5M High RJ Fleet analysis was an assessment of the potential impacts of an effective Peak Period Pricing program. Because regional jets are generally far more profitable than non-jets, the flat-fee peak period pricing program used with the other fleets was ineffective. The following section describes that analysis and the projected impacts of an effective program.

4.7.1 Peak Period Pricing Program with the 37.5M High Regional Jet Fleet

The initial Peak Period Pricing analysis for the 37.5M High RJ Fleet scenario followed the general approach used to evaluate this demand management mechanism under the other tested fleet scenarios. This approach is described in Section 4.5 of this chapter.

The fleet mix changes reflected in the 37.5M High RJ Fleet scenario have significant implications for a successful Peak Period Pricing program at Logan. First, the 37.5M High RJ Fleet includes a substantial number of regional jet operations and a greatly reduced, but still significant volume of non-jet regional carrier aircraft. It is the combination of these two aircraft types that poses the greatest problem for a flat-fee based Peak Period Pricing Program. The larger and faster regional jets are operating in markets of longer distance, higher revenue and greater profit than their non-jet predecessors, and will be less susceptible to the economic disincentive represented by the flat \$150 surcharge. A flat fee large enough to impact peak period regional jets would threaten the economic viability of non-jet services, and could result in the elimination of non-jet operations at Logan, despite the exemption program.

Table 4.7-1 compares estimated revenues and profit levels for several illustrative Logan markets served by either regional jets or conventional non-jet aircraft. It shows that the profit level achieved on a typical regional jet route can be significantly greater than the profit associated with a non-jet service. Whereas a \$150 fee could easily eliminate the profitability of a non-jet flight, particularly those operated with the smallest 9- and 19-seat aircraft, a surcharge of this magnitude is unlikely to represent a meaningful deterrent to an operator of regional jet aircraft.

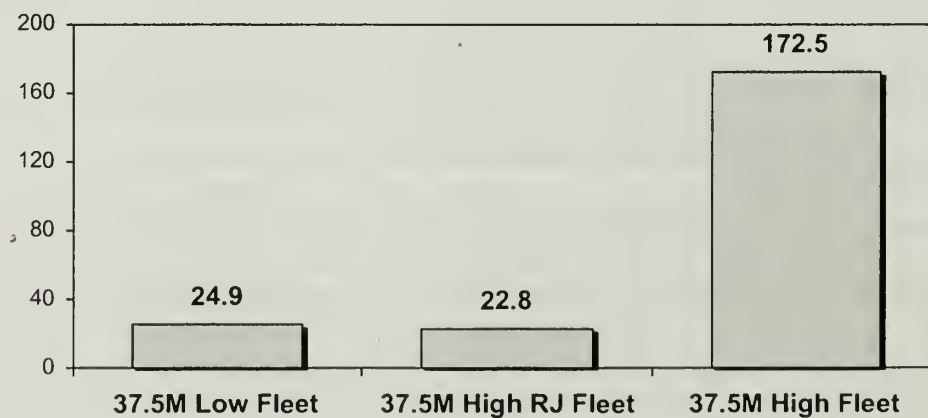
It is therefore not surprising that the analysis of a \$150 peak surcharge on the 37.5M High RJ Fleet shows only a limited impact on carrier flight schedules and the resulting Logan demand profile. Figure 4.7-1 compares the number of daily flight cancellations (summer weekday) predicted for the 37.5 million passenger fleets. The 23 daily flight cancellations estimated for a summer weekday in the 37.5M High RJ scenario are far below the predicted impact on the 37.5M High Fleet, and even below the levels estimated for the 37.5M Low Fleet. Based on previous analysis of the delay impacts associated with Peak Period Pricing under the Low Fleet scenario, it was apparent that the predicted schedule changes caused by a \$150 peak fee on the 37.5M High RJ Fleet would not produce a meaningful reduction in delays.

Table 4.7-1
Impact of a \$150 Peak Period Surcharge on Turboprop and RJ Markets

Aircraft Class and Market	Carrier	Aircraft Seat Size	Estimated Revenue Per Passenger	Revenue per Flight	Peak Fee	Peak Fee as a Percent of Revenue
Turboprop						
Nantucket	Cape Air	9	\$85	\$383	\$150	39.2%
Portland	US Airways Express	19	\$64	\$608	\$150	24.7%
Burlington	American Eagle	33	\$93	\$1,527	\$150	9.8%
Regional Jet						
Norfolk	American Eagle	37	\$193	\$3,939	\$150	3.8%
Philadelphia	Delta Connection	50	\$142	\$3,910	\$150	3.8%
Indianapolis	US Airways Express	50	\$177	\$4,858	\$150	3.1%
Richmond	US Airways Express	50	\$186	\$5,106	\$150	2.9%

Figure 4.7-1
Comparison of Impacts of a \$150 Surcharge on 2015 37.5M Fleet Scenarios – 37.5M Low vs. 37.5M High RJ vs. 37.5M High

**Summer Weekday
Cancellations**

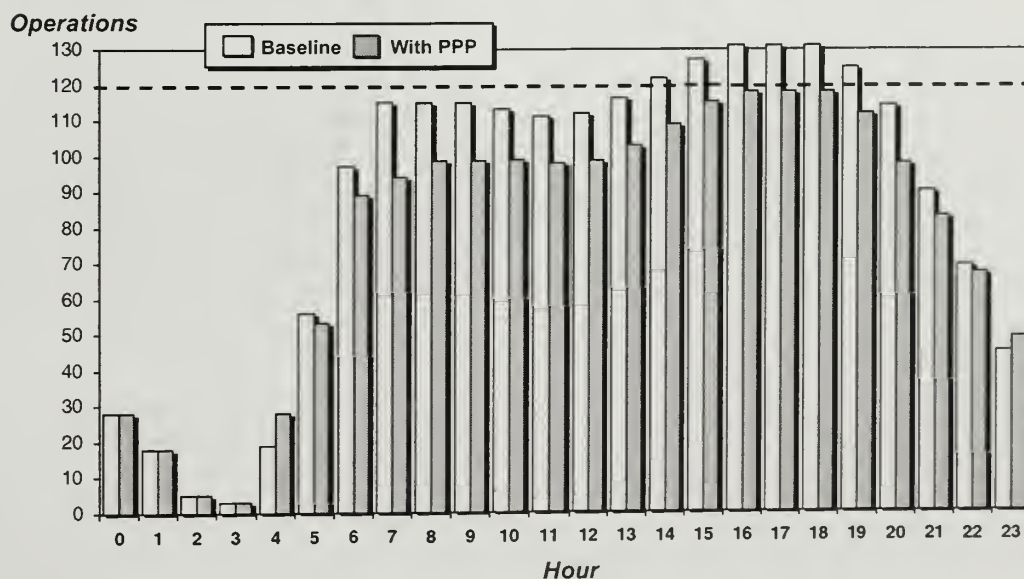


To structure a Peak Period Pricing regimen that would succeed in eliminating airline overscheduling in an environment such as the 37.5M High RJ Fleet scenario, it would be necessary to charge a substantially higher peak period surcharge. In addition to the risk of eliminating non-jets at Logan, a sufficiently high peak surcharge could produce a large surplus in airfield revenues, thereby violating the principle of revenue neutrality.

The FAA is currently evaluating alternative demand management mechanisms to replace the interim slot lottery at New York LaGuardia (see Chapter 3). Clearly, any strategy to eliminate excess airline demand at LaGuardia will have to deal with the high level of regional jet demand that emerged following passage of Air-21 in March 2000. In addressing the LaGuardia situation, the FAA may provide guidance on issues such as revenue neutrality and a mechanism to permit a continuation of turbo-prop services from small and medium-size communities. With the pending decision at LaGuardia, it is premature at this time to define the specific parameters for an effective program at Logan. Rather, these parameters will be more effectively defined at the time of implementation, following an FAA rulemaking at LaGuardia and when the specific fleet characteristics of Logan's overscheduling situation are known.

It is possible, however, to postulate what the results of an effective Peak Period Pricing program would be in terms of the program impacts on Logan's hourly demand profile. For example, in the 37.5M High Fleet scenario, Peak Period Pricing provided significant delay reduction benefits by reducing hourly flight volumes to a level below Logan's normal operating capacity of approximately 120 flights per hour. The impacts of the illustrative program on the summer demand profile for the 37.5M High Fleet scenario are shown in Figure 4.7-2.

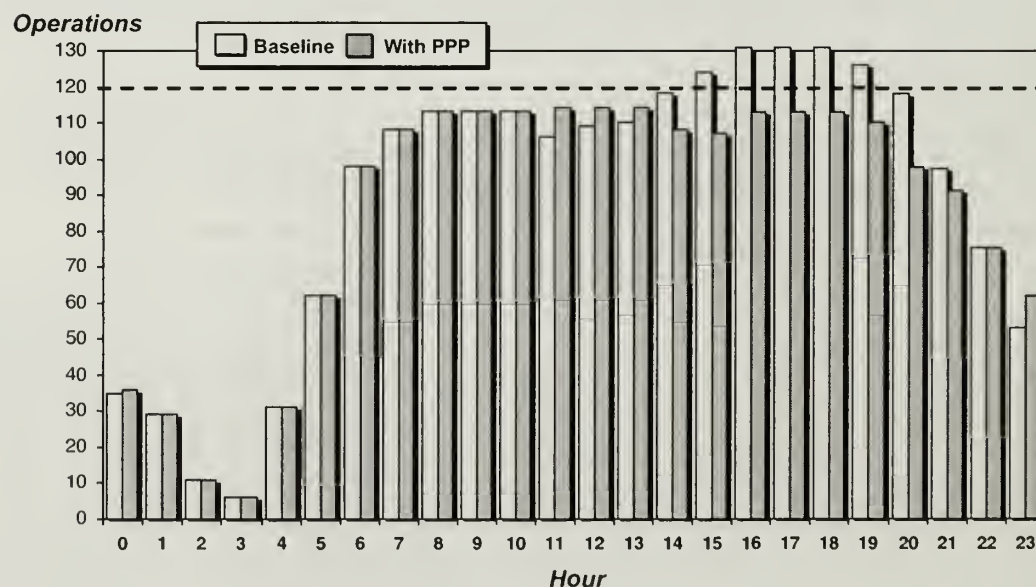
Figure 4.7-2
Comparison of August Weekday Peaking Patterns – 37.5M High Fleet
(Maximum 3-Hour Average)



The operational and environmental analysis for Peak Period Pricing on the 37.5M High RJ Fleet was structured based on projected impacts to Logan's demand profile that were comparable to those produced under the 37.5M High Fleet scenario. Figure 4.7-3 illustrates the demand profiles for a representative summer weekday that were developed to reflect the projected impacts of an effective Peak Period Pricing program on the 37.5M High RJ Fleet. It shows that the peak activity level for the busiest three-hour period is reduced from 131 flights per hour down to 114 hourly flights, and that operation levels are consistently below Logan's full operating capacity of 120 flights per hour. The changes in the profile are equivalent to approximately 18,000 annual cancellations (or 10.5 percent of the total peak period flights).

The demand profile described above, and the fleet mix associated with that demand profile, were inputs to the capacity and delay modeling for the 37.5M High RJ alternatives that included Peak Period Pricing (Alternatives 1, 2, and 3). The results of this Peak Period Pricing delays analysis are described along with the delay reduction benefits of the Preferred Alternative in the following sections.

Figure 4.7-3
Comparison of August Weekday Peaking Patterns – 37.5M High RJ Fleet
(Maximum 3-Hour Average)



4.7.2 Runway Delays

The results of the 37.5M High RJ Fleet runway delay analysis are similar to those for the other future year operating conditions. Table 4.7-2 compares the results of the runway delay analysis for the four alternatives under the 37.5M High Regional Jet scenario. The table indicates that Logan will incur extremely high levels of delay if no actions are taken to improve airport operating efficiency. For the No Action Alternative (Alternative 4), Logan passengers and airlines are forecast to experience over 370,000 annual hours of delay. With the Preferred Alternative, these runway delays are reduced by 29% to 263,000 hours, demonstrating the effectiveness of Runway 14/32. Analysis with the proposed Peak Period Pricing monitoring program indicates that the 37.5M High RJ Fleet would trigger implementation of a peak period pricing program, and under Alternative 1 (All Improvements), runway delays would be further reduced to 219,000 annual hours. This additional benefit demonstrates the effectiveness of a peak period pricing program under overscheduling conditions.

Table 4.7-2
Total Hours of Runway Delay by Alternative

Alternative	37.5M High RJ Fleet
Total Delay	
Alternative 1 – All improvements	219,200
Preferred Alternative - All except Peak Period Pricing	263,500
Alternative 2 – All except Runway 14/32	304,300
Alternative 4 - No Action	372,200
Delay Reduction	
Alternative 1 vs. Alternative 4	153,000
Preferred Alternative vs. Alternative 4	108,700
Alternative 3 vs. Alternative 4	67,900

Figure 4.7-4 shows the forecast distribution of runway delays between VFR (Visual Flight Rules) and IFR (Instrument Flight Rules) weather conditions. With the High RJ Fleet, approximately fifty percent of the modeled No Action delays occur in IFR conditions. While the proposed improvements have relatively little impact on IFR delays, VFR delays decline significantly with the airside improvements.

Figure 4.7-4
Annual Delay Hours by Weather Condition

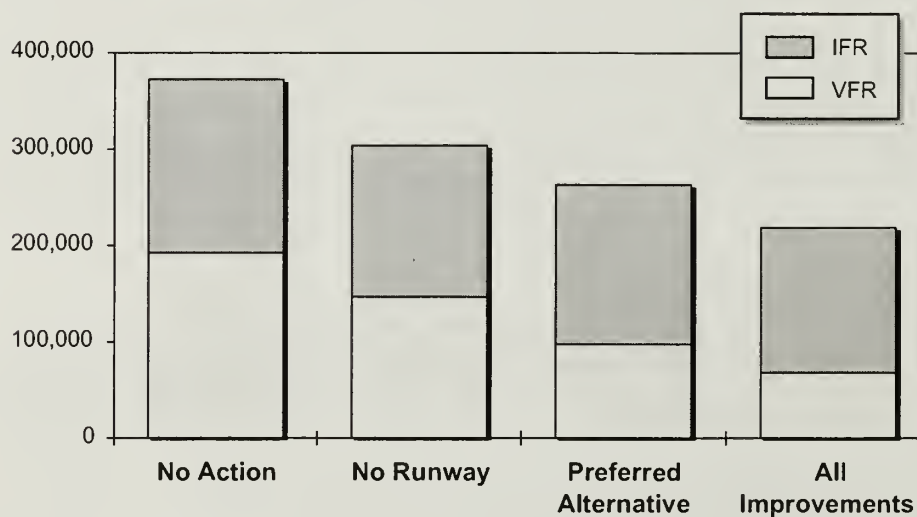


Figure 4.7-5 depicts VFR delays categorized by wind direction. A comparison of the No Action and Preferred Alternative indicates that Runway 14/32 would reduce VFR northwest wind delays by 65 percent.

4.7.3 Runway Use

The effects of the Airside Improvements on runway use for the High RJ Fleet are also similar to those presented previously for the other future scenarios.

Table 4.7-3 shows the total jet operations by operating direction for 1998 and the projections for the 37.5M High RJ Fleet. Without unidirectional Runway 14/32, the north/south communities' share of overflights would grow to 90 percent from the 76 percent that occurred in 1998. With the Preferred Alternative, jet overflights of the north/south communities decline to 58 percent. At the same time, the Preferred Alternative would increase the overwater flights by a factor of four versus the No Action scenario and would produce a much more balanced and equitable distribution of overflights. Peak period pricing would not help the disproportionate impact on the north/south communities.

Figure 4.7-5
VFR Delay Hours by Wind Direction

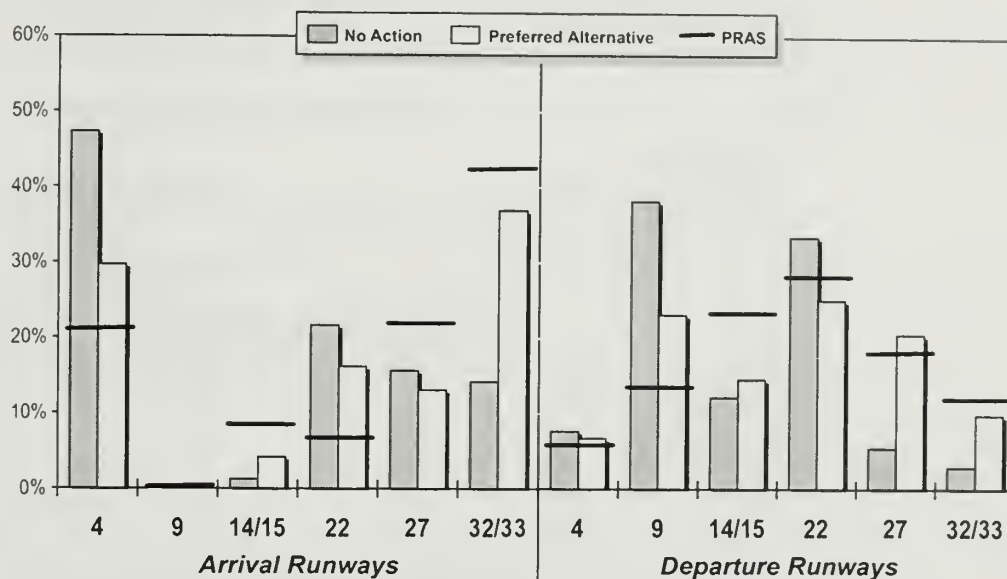


Table 4.7-3
Distribution of Jet Operations by Operating Direction

Direction	1998	37.5M High RJ Fleet			
		Alternative 4 No Action	Alternative 1A Preferred Alternative	Alternative 1 All Actions	Alternative 2/3 No Runway
North and South	76%	90%	58%	57%	91%
East (Overwater)	13%	6%	22%	22%	5%
West	11%	4%	21%	21%	4%
Total	100%	100%	100%	100%	100%

4.7.4 PRAS Goals

This section describes how the differences in runway use patterns provided by the Airside Improvements would produce an overall improvement in future compliance with the annual and short-term PRAS goals under the 37.5M High RJ scenario.

4.7.4.1 Annual Runway End Use Goals

As discussed previously, the annual PRAS goals use effective jet utilization⁷ which weights nighttime operations ten times more heavily than daytime operations. Table 4.7-4 compares the effective jet utilization for 1998 and the four modeled alternatives of the 37.5M High RJ Fleet.

Table 4.7-4
Distribution of Effective Jet Operations by Operating Direction

Direction	1998	37.5M High RJ Fleet			
		Alternative 4 No Action	Alternative 1A Preferred Alternative	Alternative 1 All Actions	Alternative 2/3 No Runway
North and South	69%	84%	60%	59%	83%
East (Overwater)	21%	11%	23%	24%	12%
West	10%	5%	17%	17%	5%
Total	100%	100%	100%	100%	100%

Without unidirectional Runway 14/32 the percentage of effective jet operations impacting populated areas to the north and south of Logan is projected to increase from 69 percent in 1998 up to 84 percent in the 37.5M High RJ Fleet scenario. The Preferred Alternative increases overwater flights and achieves a more balanced distribution of operations over land. For example, the Preferred Alternative more than doubles equivalent jet operations over Boston Harbor, while reducing them over the northern and southern communities by 29 percent. The effective jet utilization of runways affecting communities to the north and south together would decline to 60 percent (less than 1999's 68 percent) with the availability of Runway 14/32. Moreover, by reducing delays at the airfield which shift some flights into the nighttime hours, the Preferred Alternative would also yield an 8 percent reduction in total effective jet operations. Peak Period Pricing (Alternative 1) would provide a slight additional reduction in total effective jet operations by canceling a few regional jet flights, but by itself (Alternatives 2/3) would not permit any relief to the northern and southern communities.

Tables 4.7-5 and 4.7-6 compare the effective jet utilization of the four Airside Improvement alternatives with 1998 actual use and with the PRAS annual goals, while Figure 4.7-6 presents the 37.5M High RJ runway end use graphically. The Preferred Alternative offers a dramatic improvement in overall annual PRAS goal achievement. The PRAS Performance Index (PPI) described previously in this chapter shows that the Preferred Alternative improves PRAS conformance by a factor of 2.7 (see Table 4.7-7).



⁷ Effective jet utilization excludes non-jet operations and weights nighttime jet operations, operated from 10:00 PM to 7:00 AM, by a factor of 10.

Table 4.7-5
Effective Arrivals and PRAS Goals by Runway End

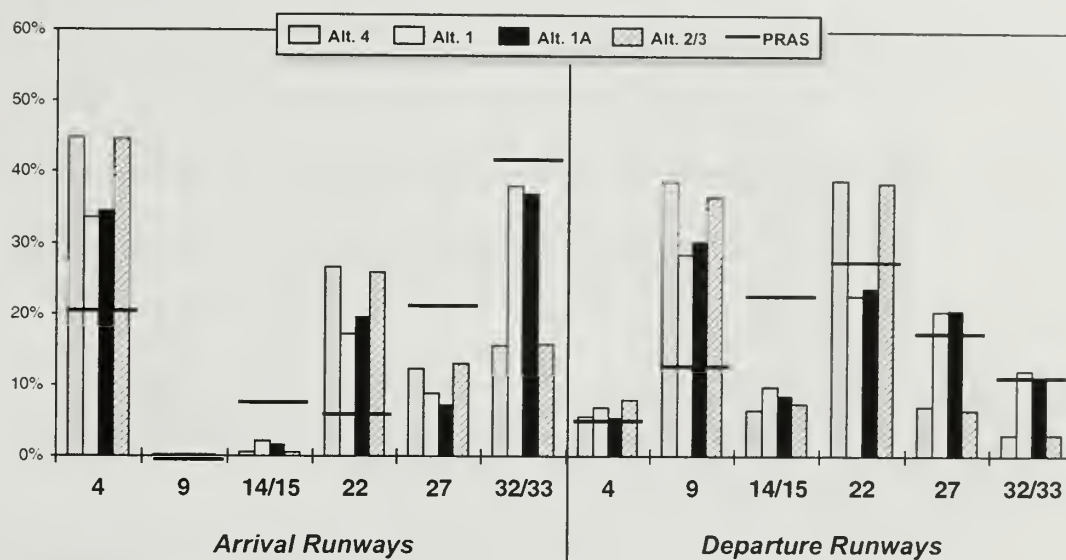
Runway End and Improvement Concept	Percent Effective Arrivals	
	1998 Historic	2015 High RJ
Runway 4L/R		
PRAS Goal	21.1	21.1
Alternative 1 - All Actions	--	33.5
Preferred Alternative - All Except Peak Period Pricing	--	34.4
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	44.6
Alternative 4 - No Action	36.7	44.7
Runway 15L/R		
PRAS GOAL	8.4	8.4
Alternative 1 - All Actions	--	2.2
Preferred Alternative - All Except Peak Period Pricing	--	1.7
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	0.6
Alternative 4 - No Action	1.2	0.6
Runway 22L/R		
PRAS Goal	6.5	6.5
Alternative 1 - All Actions	--	17.3
Preferred Alternative - All Except Peak Period Pricing	--	19.6
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	26.0
Alternative 4 - No Action	11.9	26.7
Runway 27		
PRAS Goal	21.7	21.7
Alternative 1 - All Actions	--	8.9
Preferred Alternative - All Except Peak Period Pricing	--	7.2
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	13.0
Alternative 4 - No Action	21.7	12.3
Runways 33L and 32		
PRAS Goal	42.3	42.3
Alternative 1 - All Actions	--	38.1
Preferred Alternative - All Except Peak Period Pricing	--	37.0
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	15.7
Alternative 4 - No Action	28.6	15.5

Table 4.7-6
Effective Departures and PRAS Goals by Runway End

Runway End and Improvement Concept	Percent Effective Departures	
	1998 Historic	2015 High RJ
Runway 4:/R		
PRAS Goal	5.6	5.6
Alternative 1 - All Actions	--	6.8
Preferred Alternative - All Except Peak Period Pricing	--	5.5
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	7.9
Alternative 4 - No Action	6.6	5.6
Runway 15L/R and 14		
PRAS Goal	23.3	23.3
Alternative 1 - All Actions	--	9.7
Preferred Alternative - All Except Peak Period Pricing	--	8.6
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	7.4
Alternative 4 - No Action	10.9	6.6
Runway 22L/R		
PRAS Goal	28.0	28.0
Alternative 1 - All Actions	--	22.7
Preferred Alternative - All Except Peak Period Pricing	--	23.7
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	38.7
Alternative 4 - No Action	30.9	38.9
Runway 27		
PRAS Goal	17.9	17.9
Alternative 1 - All Actions	--	20.5
Preferred Alternative - All Except Peak Period Pricing	--	20.7
Alternative 2/3 - All Except Runway 14/32 and No Build	--	6.6
Alternative 4 - No Action	16.6	7.1
Runway 33L		
PRAS Goal	11.9	11.9
Alternative 1 - All Actions	--	12.1
Preferred Alternative - All Except Peak Period Pricing	--	11.2
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	3.0
Alternative 4 - No Action	5.2	3.0
Runway 9		
PRAS Goal	13.3	13.3
Alternative 1 - All Actions	--	28.4
Preferred Alternative - All Except Peak Period Pricing	--	30.2
Alternatives 2/3 - All Except Runway 14/32 and No Build	--	36.6
Alternative 4 - No Action	29.9	38.8

Figure 4.7-6

Runway Utilization and PRAS Goals -- 2010 37.5M High RJ (585,000 Operations)
Percent of Equivalent Operations by Runway

**Table 4.7-7**

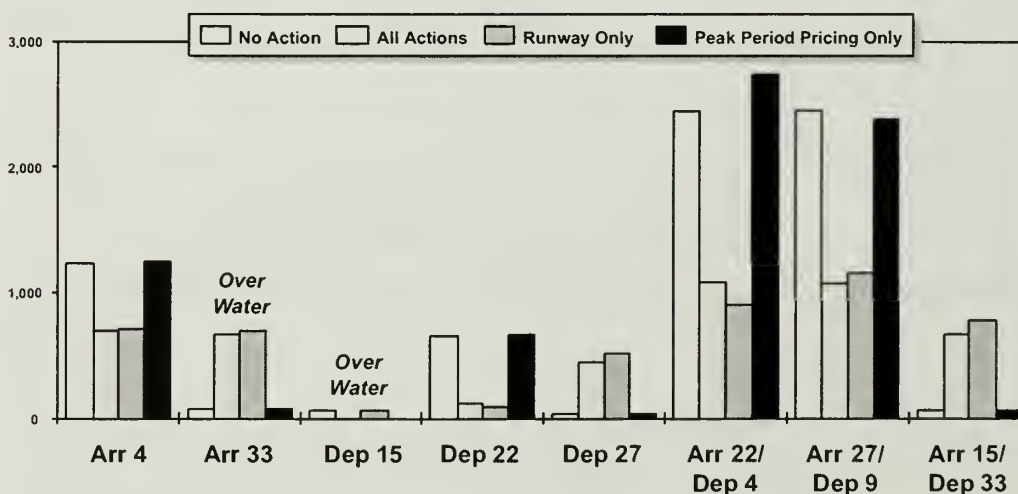
Achievement of Annual PRAS Runway Use Goals

Improvement Concept	PRAS Performance Index	
	1998	2015
	Historic	High RJ
Perfect PRAS Compliance	0	0
Alternative 1 -- All Improvements		943
Preferred Alternative - All Except Peak Period Pricing		1,160
Alternative 2/3 -- All Except Runway 14/32		2,893
Alternative 4 -- No Action	997	3,078

4.7.4.2 Dwell and Persistence

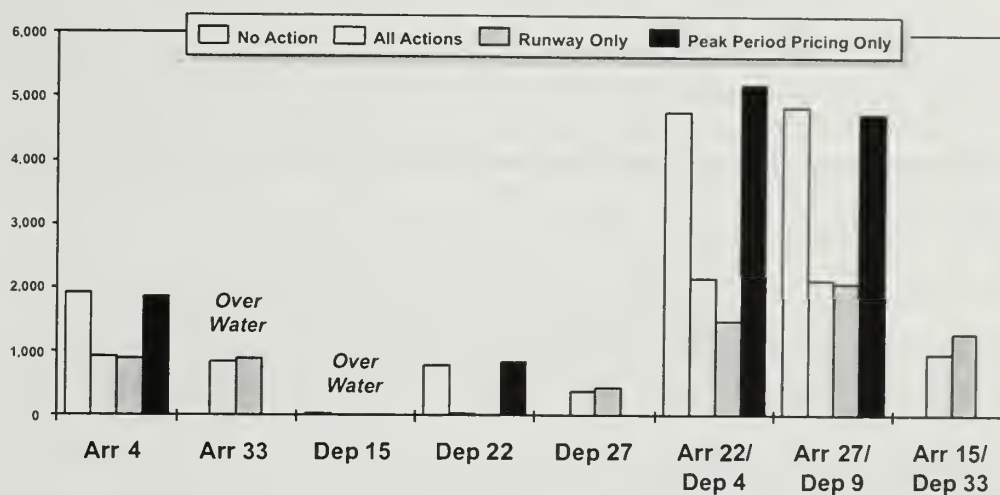
Figure 4.7-7 presents the annual hours of dwell exceedence for the High RJ scenario by runway end for each improvement alternative. The addition of Runway 14/32 and the reduced minimums of the Preferred Alternative result in substantial short-term noise benefits, with 30 percent fewer total hours of dwell over populated areas. Peak period pricing, either alone or with the runway, does not produce any significant changes in dwell. With the runway, communities to the north (A22/D4 and A27/D9) and south (A4 and D22) experience substantial short-term noise relief, while the overwater zones (A33/32 and D15/14) receive more dwell. Dwell also increases for populated areas to the west (D27), but those communities still receive less impact than the north and south populations, and total exposure is reduced.

Figure 4.7-7
Dwell Exceedence by Noise Area – 2010 37.5M High RJ Fleet
Annual Hours of Dwell Exceedence



The annual hours of persistence exceedence are presented in Figure 4.7-8 by runway end and alternative. The results are generally consistent with those for dwell, but the magnitude of the benefits are even greater. The Preferred Alternative reduces total persistence exceedence by 42 percent, or 49 percent if overwater areas are excluded. Peak period pricing actually increases the persistence exceedence slightly. Although communities to the west receive a moderate increase in persistence exceedence with the Preferred Alternative, the level is far less than that suffered by the north or south communities.

Figure 4.7-8
Persistence Exceedence by Noise Area – 2010 37.5M High RJ Fleet
Annual Hours of Persistence Exceedence



4.7.5 Sensitivity to Regional Jet Runway Use

The 37.5M High RJ Fleet scenario was developed to assess the potential impact of regional jet aircraft on the future utility of the proposed Runway 14/32. The regional jets in this scenario comprise nearly one-third of the total flight operations. Of these, 55 percent are by Embraer models (ERJ), 24 percent by Dornier/Fairchild models (DRJ), and 21 percent by Canadair models (CRJ). A key factor in the operational evaluation was the ability of these new regional jets to land on a 5,000 foot runway. The airframe manufacturers specifications and the FAA type certifications indicate that the regional jets produced by all three makers are capable of landing in less than 5,000 feet over a 50-foot obstacle when the aircraft is at maximum gross weight, the runway is dry, there is no wind, and the temperature is below 60 degrees Fahrenheit. However, the conditions of each flight operation are different, and a fully loaded CRJ, for example, would not be able to land on 5,000 feet on a warm rainy summer day. On the other hand, few regional flights operate at maximum gross weight, and normally when Runway 32 is in use northwest winds will provide a headwind that can substantially reduce landing distances. Moreover, there is no obstacle on the approach end of Runway 32, and the length of the runway plus the safety areas on both ends add up to 7,000 feet of paved surface. When long delays exist on Runway 33L under strong northwest wind conditions, it is unlikely that many would reject the option of a perfectly safe and legal landing on Runway 32, particularly as they gain familiarity with the new runway.

The assumptions for regional jet use of Runway 32 were based on the analysis conducted by FAA's consultant that DRJs would use it under wet or dry conditions, ERJs would accept it under dry conditions, and CRJs would refuse it. (See Appendix C). This policy resulted in a 29 percent reduction in runway delays for the Preferred Alternative compared to the No-Action Alternative. To assess the sensitivity of delays to the possible regional jet utilization of Runway 32, two other cases were modeled. One extreme was to assume all

regional jets could and would use Runway 32 under all conditions. The other was to assume that only the DRJs would use the new runway. The results of the sensitivity analysis are presented in Table 4.7-8. Under the most optimistic assumption—that all regional jets use the runway—the incremental delay savings are 9,500 hours or just 2.6 percent more than the nominal 29 percent. The very pessimistic assumption that only the DRJs use Runway 32 still saves 76,400 hours of delay per year, or 21 percent less than would occur under the No Action scenario. The conclusion of the sensitivity analysis is that, depending on the regional jet use, Runway 14/32 will save between 76,000 and 118,000 hours of delay per year, with the best estimate being about 108,000 hours.

Table 4.7-8
Sensitivity of Delays to Regional Jet Use of Runway 32

Alternative	Runway 32 Assignment						Annual Delay Hours Saved	Percent Delay Savings
	Dormier		Embraer		Canadair			
	Dry	Wet	Dry	Wet	Dry	Wet		
No Action Alternative (Alt. 4)							N/A	
Preferred Alternative (Alt. 1A)								
Nominal (Base Case)	X	X	X				108,100	29.0%
High	X	X	X	X	X	X	117,600	31.6%
Low	X	X					76,400	20.5%

4.7.6 Northwest Wind Restriction on Use of Runway 32

One of the issues raised in the SDEIS Panel Process was the possibility of restricting the availability and use of Runway 32 to northwest wind conditions only. This concept was conceived as a potential limit on the increase in the number and proportion of jet departures on Runway 27 that was predicted to occur with construction of Runway 14/32. Runway 27 is the principal departure runway used in combination with arrivals on Runways 33 and 32 in the new three-runway configuration that would become available with construction of unidirectional Runway 14/32. With the proposed runway, Logan would have three-runway configurations available in three distinct operating directions: to the northeast using Runways 4L/4R and 9, to the southwest using Runways 22L/22R and 27, and to the northwest using Runways 33/32 and 27.⁸

Currently, when wind conditions require air traffic control to route aircraft on a northwesterly heading, available airfield capacity declines sharply from Logan's normal three-runway capacity down to the capacity of two, and sometimes just one runway. As described throughout this report, the construction of Runway 14/32 would prevent this



⁸ Construction of the proposed new runway would also create a fourth three-runway configuration—Runways 15/14/ and 9—in a southeast alignment. However, this configuration would have limited arrival capacity.

substantial decline in airfield capacity, and the resulting aircraft delay that now occurs under these conditions.

The increased usage of Runway 27 projected in the airfield simulation modeling reflects the availability of this new three-runway configuration in the northwest direction. This configuration would not only allow controllers to nearly eliminate northwest wind delays at Logan, but would also enable air traffic control to more evenly distribute aircraft overflights across three different operating directions during periods of high demand. As discussed previously in this chapter, this flexibility leads to a significant improvement in the ability of air traffic control to achieve the Preferential Runway Assignment System (PRAS) goals and provides relief to residents of communities impacted by use of the existing north and south runway configurations.

The full analysis of the proposed northwest wind restriction on Runway 32 is presented in Appendix D of this Supplemental DEIS/FEIR. Major findings are summarized below.

4.7.6.1 Summary of Results for a Northwest Wind Restriction on Runway 32

A northwest wind restriction would sacrifice a portion of the delay reduction benefits that could be realized through unrestricted usage of unidirectional Runway 14/32. Even at the least severe 5-knot wind restriction, Logan would experience 17,000 more hours of annual aircraft delay under the 37.5M High RJ Fleet scenario than it would with an unrestricted runway. As the wind speed criterion is increased, further limiting the circumstances in which Runway 14/32 could be used, the delay benefits of the proposed runway are progressively eroded.

The proposed restriction does limit the increase in jet departures off Runway 27 that results from its use in combination with Runways 33L and 32. With a 5-knot northwest wind restriction, usage of Runway 27 declines from 29 percent to 18 percent of total Logan jet departures.

However, the decreased usage of Runway 27 corresponds with other, less desirable changes in runway utilization at Logan. Restrictions on the use of Runway 32 would limit the number of aircraft using over-the-water routings to Runways 32 and 33L. The proposed restriction also sacrifices potential relief to residents of communities impacted by the prevailing north/south runway configurations at Logan.

Restricting the use of Runway 32 would reduce the ability of air traffic controllers to achieve the PRAS goals, including the annual runway use goals and the short-term goals designed to limit dwell and persistence of overflights impacting individual communities.

A wind restriction on the use of Runway 32 would increase the number of people exposed to the highest noise levels above 70 DNL (compared to an unrestricted runway). However, the restriction would at the same time lower the population exposed to noise levels greater than 65 DNL. These impacts occur due to changes in runway utilization patterns that result from restricting the use of Runway 32.

4.8 Conclusion

Logan is currently the sixth most delayed airport in the United States, and experienced approximately 142,000 hours of total aircraft delay in 1998. If no improvements are made at Logan, continuing growth in demand for air transportation services will be accompanied by a significant increase in delays. Conversely, the Preferred Alternative represents an effective means to minimize the growth in delays, enhance safety, allow for better achievement of PRAS goals, and increase the number of flights over water.

The delay reduction benefits attributable to the various Airside Project Alternatives were assessed against a range of potential future fleet scenarios. This analytic approach provides an understanding of the circumstances under which individual improvement concepts are most effective, and how their contribution may vary according to future operating conditions at Logan. The analysis demonstrated that Alternatives that include Runway 14/32 provide a significant reduction in delay in both the near- and longer-term operating environment at Logan. Delay reduction benefits associated with the Preferred Alternative range from 21 percent (or 28,000 annual hours) under the 29M Low Fleet, to 29 percent (or 109,000 hours) under the 37.5 M High Fleet scenario. The greatest benefits occur during VFR weather conditions when the availability of Runway 14/32 would reduce future delays by approximately 50 percent or more.

Unidirectional Runway 14/32 reduces delays by enabling Logan to maintain its normal three-runway capacity when wind conditions require operations in the northwest direction. Since operations in turboprops have declined and regional jets have entered the fleet, commenters questioned the utility of the proposed runway. Even though the unidirectional Runway 14/32 is only 5,000 feet long, the FAA consultant evaluated the probable utilization by regional jets and found that the runway length would be acceptable for most future RJ's at Logan.

Runway 14/32 would be permitted and operated as a unidirectional runway, with all arrivals and departures occurring over Boston Harbor. As a result, 52,000 jet flights, or 17 percent of total jet operations for the 29M Low Fleet, would shift from flight paths over communities to flight paths over the water. By establishing an additional three-runway configuration at Logan, Runway 14/32 would provide greater flexibility in runway selection. This increased flexibility will permit a substantial improvement in the achievement of the annual PRAS runway use goals, designed to produce an equitable distribution of impacts across surrounding communities.

Incorporating a northwest wind restriction on Runway 32 would limit the increase in jet departures on Runway 27 that results from the availability of an additional three-runway configuration at Logan. However, this restriction would sacrifice a portion of the delay reduction benefits provided by the runway, and would also limit the relief provided to communities affected by the north/south runways which are already the most heavily utilized at Logan.

The Centerfield Taxiway and other proposed taxiway improvements provide consistent delay reduction benefits across future fleet scenarios by increasing the efficiency of Logan's taxiway system and reducing aircraft taxi delays by 47 percent with the 29M Low Fleet and 26 percent with the 37 M High Fleet (Alternative 2 vs. Alternative 3). The runway and taxiway improvements also enhance operational safety at Logan by reducing congestion on the ground and lowering the potential for runway incursions or wingtip conflicts.

Reduced minimums provide some delay reduction benefits and enhance safety by increasing runway availability options in Instrument Flight Rules (IFR). Reducing minimums do not change the flight path of arriving flights, but move the decision point for missed approaches closer to the airport, or over the airport. Reducing minimums will permit pilots to operate on optimal runways during crosswind conditions. While reduced minimums result in a modest annual delay reduction benefit, they are particularly effective during IFR weather conditions.

Peak Period Pricing is designed to reduce delays resulting from airline overscheduling which occurs when flight demand exceeds Logan's normal VFR capacity. Current and expected near-term demand patterns at Logan do not exhibit an overscheduling condition. In this environment, Peak Period Pricing would produce marginal delay reduction benefits while imposing heavy economic costs on regional carriers and small communities.

The illustrative Peak Period Pricing program with a \$150 surcharge was ineffective at reducing delays under the 37.5M High RJ Fleet scenario. A higher peak fee would be required to provide meaningful delay reduction under this fleet scenario, principally due to the higher revenue and profitability of regional jet services as compared with non-jets. An effective Peak Period Pricing program that eliminates overscheduling in the High RJ Fleet was projected to reduce runway delays by approximately 68,000 annual hours or 18 percent (Alternative 2/3). While not recommending Peak Period Pricing for current implementation at Logan, Massport is establishing a schedule monitoring system to determine if and when to initiate curative action, which would lead to the implementation of Peak Period Pricing if necessary. As a first step in its curative action plan, Massport will initiate collaborative discussions with individual Logan carriers aimed at improving scheduling efficiency at Logan and postponing or eliminating the potential future emergence of airline overscheduling conditions. Massport is also anticipating guidance from the FAA as to key elements of a Peak Period Pricing program as the FAA addresses this issue at LaGuardia over the next several months.

